midi LOGGER

GL450/400/350

GL400-UM-251

SERVICE MANUAL

GL400-UM-251-13-9370

GRAPHTEC

HISTORY OF REVISIONS

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13	06.09.13	The remark for the terminal board and the terminal relay board added.	6-8,6-9	12
14	07.03.29	Part number for the bottom case 450 added.	6-7	13

TO ENSURE SAFETY

This Service Manual has been compiled for the purpose of facilitating repair and maintenance of the GL450/400/350 midi LOGGER by Graphtec service personnel and other persons who have undergone equivalent technical training.
Maintenance or repair by unauthorized service personnel is to be strictly avoided. Because the GL450/400/350 contains numerous internal components with a high electric potential, such work by unauthorized service personnel could cause human injury or serious damage to the GL450/400/350 midi LOGGER.

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1. CONFIGURATION

1.1 Model Configuration

GL450 : 10-channel model with color monitor and internal memory (Replaced model from the GL400/350)

GL400 : 10-channel model with color monitor and internal memory

GL350 : 10-channel model with internal memory

1.2 Accessories and Options

GL400/350

Unit name	Model name	Description
10 channels/terminal unit	10SU	10 channels/unit (2 units mountable for a maximum of 20 channels)
20 channels/terminal unit	20SU	20 channels/unit (2 units mountable for a maximum of 40 channels)
50 channels/terminal unit	50SU	50 channels/unit (2 units mountable for a maximum of 100 channels)
Battery Pack	B-511	
Battery Charger	B-512	
Logic Alarm Cable	B-513	
DC Drive Cable	B-514	
Cable to connect main units together	B-515	

GL450

Unit name	Model name	Description
10 channels/terminal unit	10TU	10 channels/unit (2 units mountable for a maximum of 20 channels)
20 channels/terminal unit	20TU	20 channels/unit (2 units mountable for a maximum of 40 channels)
50 channels/terminal unit	50TU	50 channels/unit (2 units mountable for a maximum of 100 channels)
Humidity Sensor	B-530	
Battery Pack	B-517	Same as GL500
Logic Alarm Cable	B-513	Same as GL400/350
DC Drive Cable	B-514	Same as GL400/350
Cable to connect main units together	B-515	Same as GL400/350

2. UPGRADING THE FIRMWARE

The version of your GL450/400/350's firmware can be upgraded by rewriting the flash ROM on the pertinent circuit boards using a choice of methods. You can upgrade the firmware by loading the update program from either a personal computer via the TCP/IP port or from a PCMCIA card.

2.1 How to Upgrade the GL450/400/350 Flash ROM from the PCMCIA Card

Preparations for the upgrade

Firmware :Mxxxa001.G40← Main Program file for GL450/400/350
:Mxxxa002.G40← Main Program file for GL450/400/350
Use from version 2.0 to the GL450.
Do not use latest version 2.0 to the GL400/350.

(1) Connect the AC adapter for the GL450/400/350.

(2) Turn on the GL450/400 and then adjust the monitor contrast using the monitor control dial when you are going to upgrade the GL450/400.

Turn off the GL450/400 after adjust the monitor contrast.

(3) Copy the two main program files to a PCMCIA card from the computer.

How to upgrade

(1) Insert the PCMCIA card containing the main upgrade program into the GL450/400/350's PCMCIA card slot.

(2) Turn on the GL450/400/350 to automatically execute the upgrade program.

(3) Wait until the display shown below appears or until the beeper sound stops.

Note:

Don't turn off the GL450, GL400 or the GL350 until this process is finished.

GL400

The following message will appear on the GL400 display in yellow characters when the upgrade is complete. Also the beeper will sound for 5 seconds.
"Please Turn Off the Power. I have locked up."

Note:
Adjust the the monitor contrast using the monitor control dial when the above message will not appear on the GL450/400.

GL350

The beeper will sound for 5 seconds when the upgrade is complete.

(4) Turn off the power to the GL450/400/350 when the above message is displayed or when the beeper sound stops.

(5) Delete the two main program files in a PCMCIA card from the computer.
This is avoiding to upgrade by mistake.

2.2 How to Upgrade the GL400/350 Flash ROM from the TCP/IP Port

Preparations for the upgrade

(1) Connect the AC adapter for the GL450/400/350.

(2) Connect the LAN cable for the GL450/400/350 and PC. (If you connect P to P, use a cross LAN cable. If you connect with a hub, use a parallel LAN Cable.)

How to upgrade

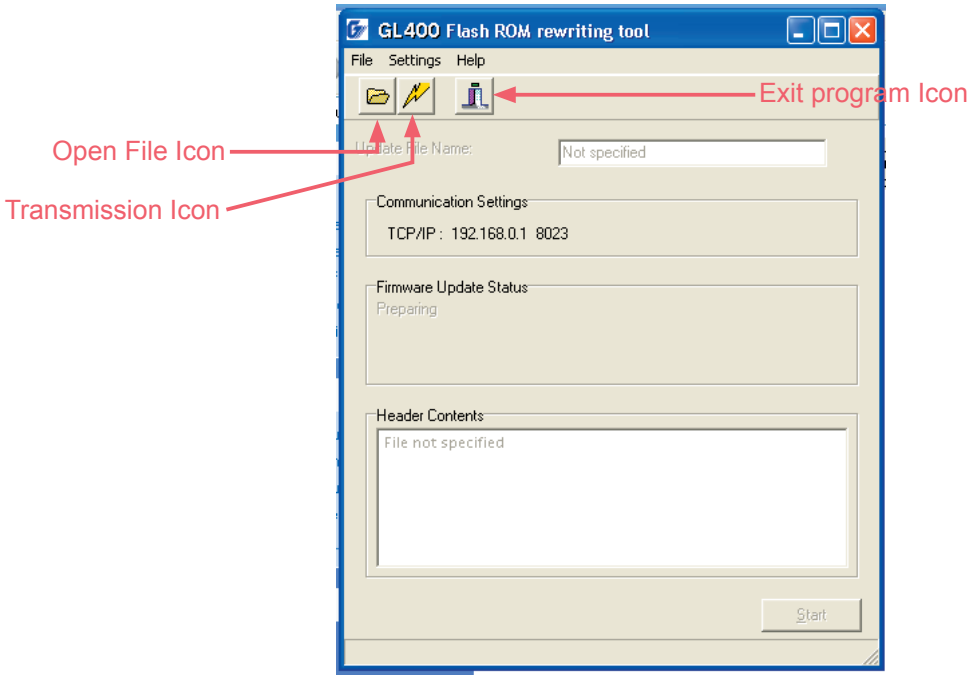
OS :Windows 2000/XP
Software :GL40upd.exe ← Upgrade software file
:xxx.dll ← Upgrade software dll file
Firmware :Mxxxa001.G40 ← Main Program file for GL450/400/350
:Mxxxa002.G40 ← Main Program file for GL450/400/350
Use from version 2.0 to the GL450.
Do not use latest version 2.0 to the GL400/350.

(1) Copy the two upgrade software files to the same directory in the PC.

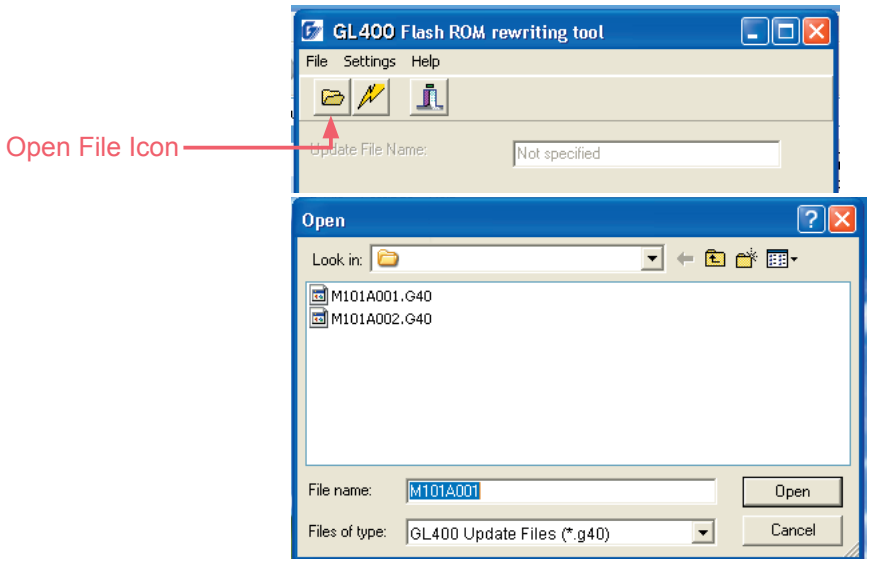
(2) Turn on the power switch of the GL450/400/350.

(3) Execute GL40upd.exe.

(4) Display the menu as shown below.

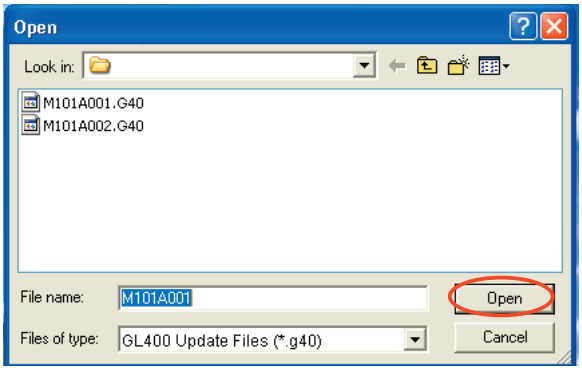


(5) Click the Open File icon to show the menu as below.

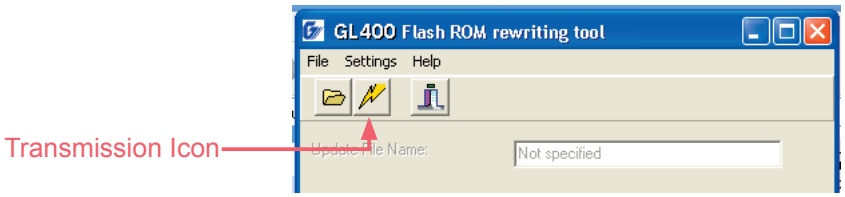


(6) Select the main update file as ”Mxxxa001.G40.

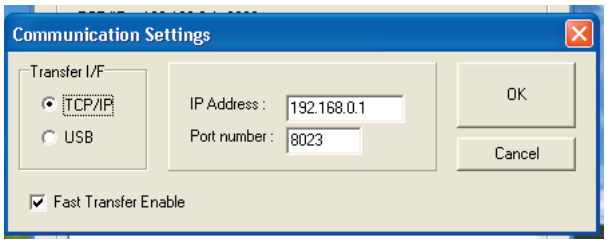
(7) Click the Open Button.



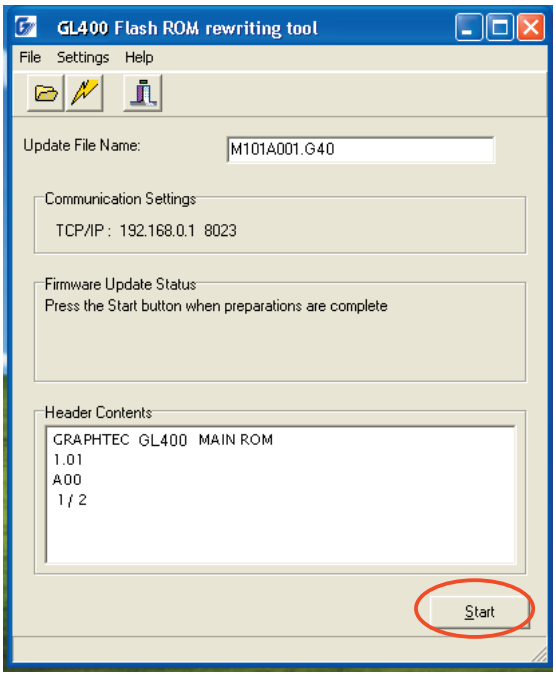
(8) If you need to change the TCP/IP settings, click the transmission icon to set up the TCP/IP conditions.



The default settings for the GL450/400/350 are set as follows.
IP Address: 192.168.0.1
Subnet mask: 255.255.255.0
Port number: 8023
If you haven't changed them, use these settings.
Also, your computer's TCP/IP port setting must be set to the same segment as "192.168.0.X".



(9) Click the Start button to start upgrading when you are ready to upgrade.



GL450/400

The following message will appear on the GL450/400 display in yellow characters when the upgrade is complete. Also the beeper will sound for 5 seconds.
"Please Turn Off the Power. I have locked up."

GL350.

The beeper will sound for 5 seconds when the upgrade is complete.

(10) Turn off the power to the GL450/400/350 when the above message is displayed or when the beeper sound stops.

3. DISASSEMBLY AND REASSEMBLY

3.1 Notes on Disassembly and Reassembly

- During disassembly, disconnect the cables from the specified connectors as necessary.
- During reassembly, double-check to ensure that the proper cables have been correctly re-connected to the pertinent connectors.
- Some areas of the control panel unit possess a high electrical potential, so exercise caution to avoid an electrical shock.
- When handling the LCD shield and LCD protective plate, be careful not to leave fingerprints or other marks on them.

3.2 Mounting and Removing the Input Terminal Unit

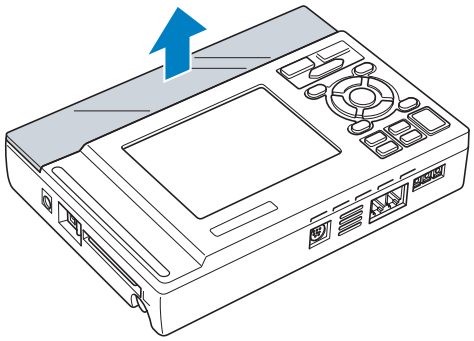
This section describes how to mount and remove the input terminal unit.

CAUTION

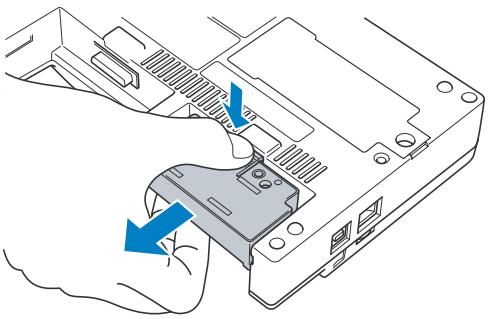
- Make sure that the power supply has been turned off before mounting or removing the input terminal unit.

Removing the Input Terminal Unit

(1) Remove the cover from the input terminal mounting area.

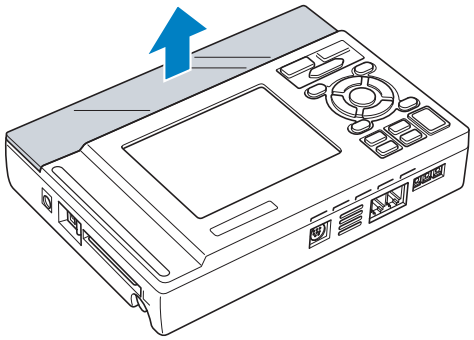


(2) Press down on the lock button while pulling the input terminal unit towards you. At this time, grip the input terminal unit firmly while removing it.

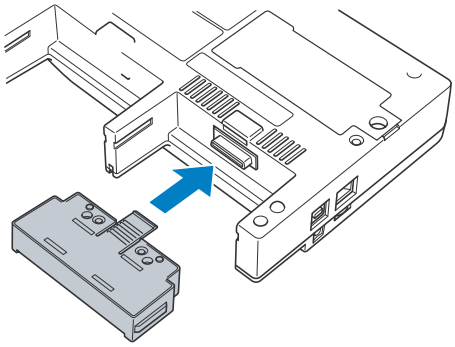


Mounting the Input Terminal Unit

(1) Remove the cover from the input terminal mounting area.



(2) As shown in the figure below, insert the input terminal unit in the GL450/400/350. At this time, be sure to check that the terminal unit is locked onto the connector.



3.3 Replacing the Main Board

Disassembly

(1) Remove the input terminal unit from the GL450/400/350 (See Section 3.2.).

(2) Remove the M3L30 binding head screw and the four M3L10 self tapping screws from the bottom cover.

(3) Release the top cover hook from the bottom case, and then remove the top cover assembly (GL450/400) or the top cover (GL350).

NOTE:
Take care with the flexible cable connecting the top cover assembly and the bottom case assembly when you are removing the top cover assembly for the GL450/400.

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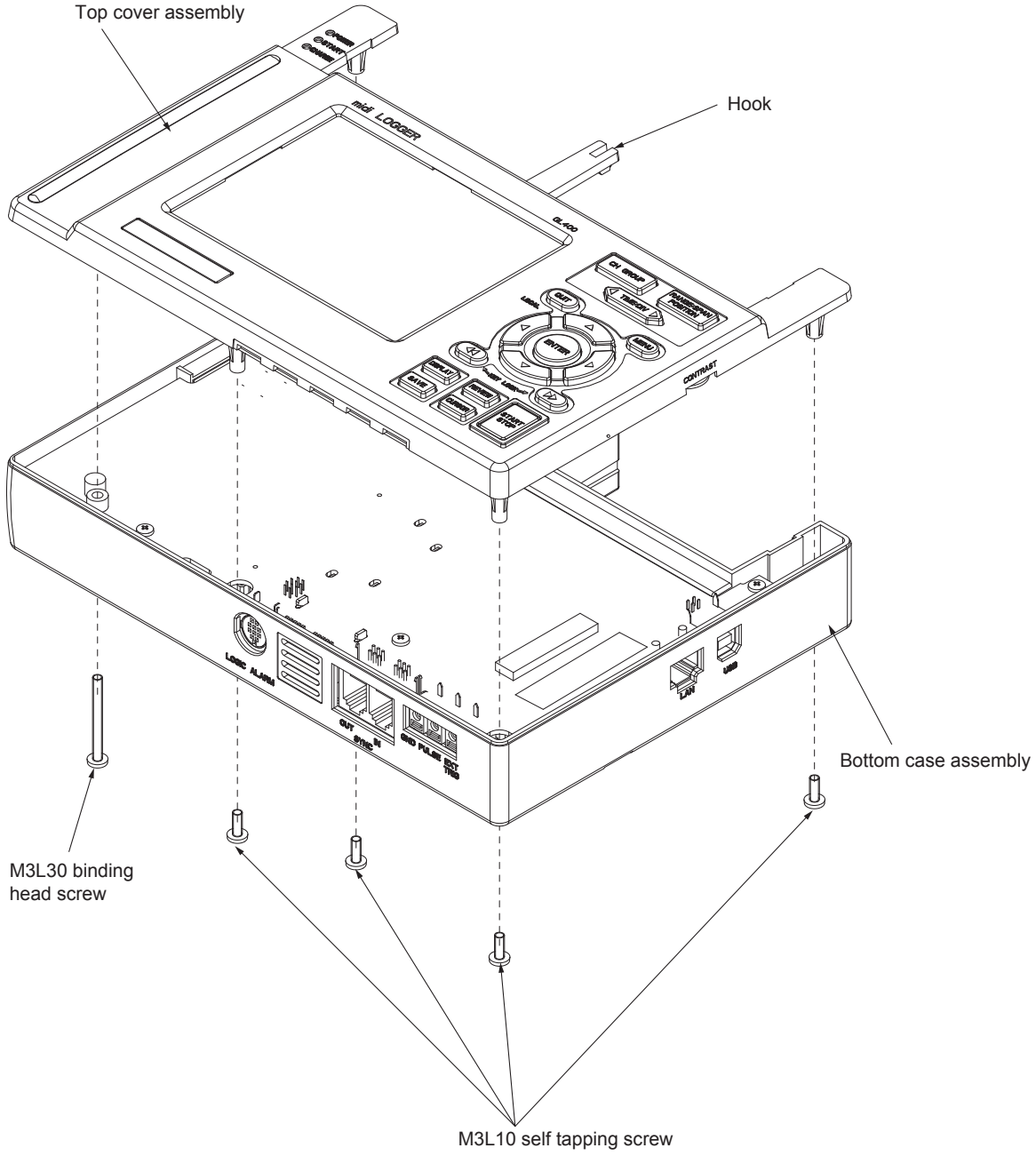
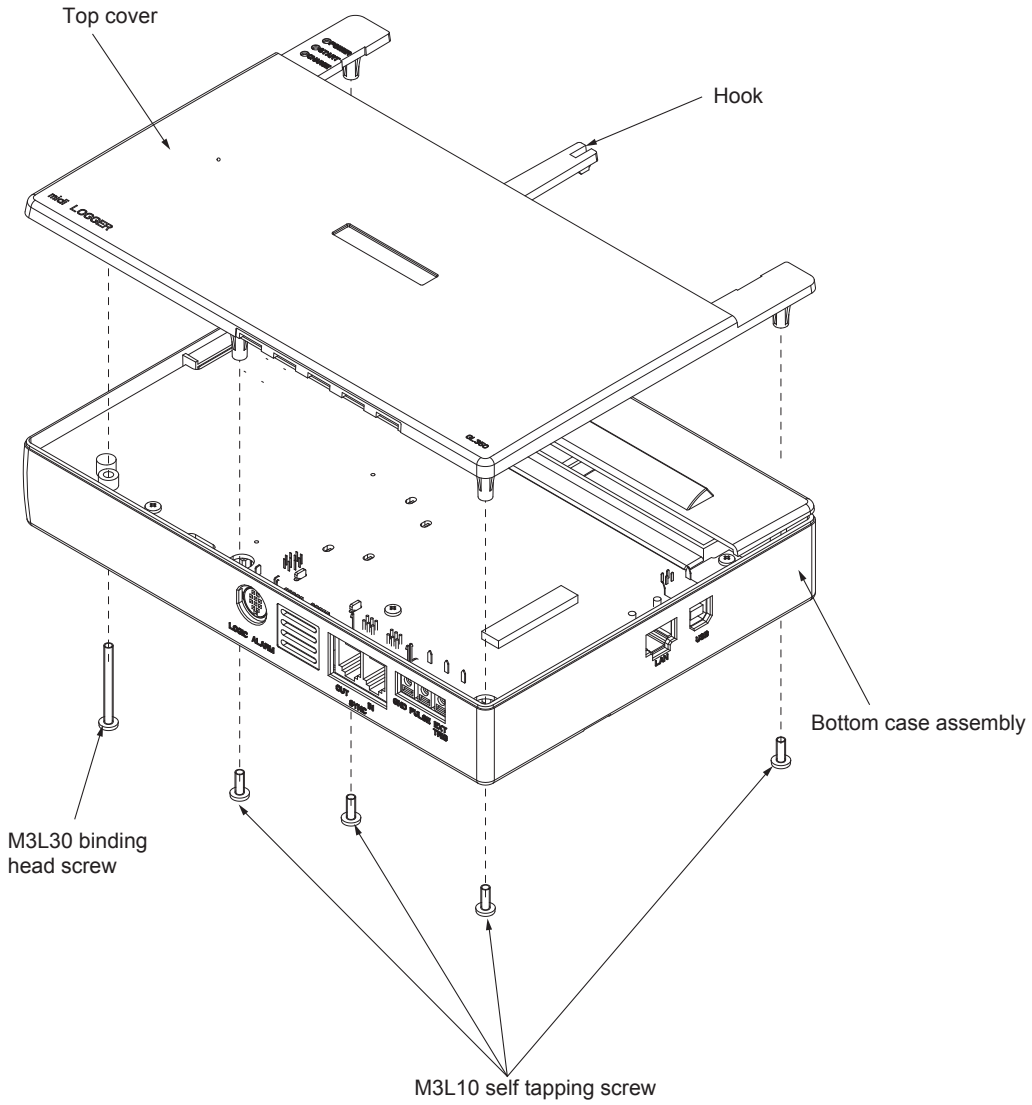
(4) Disconnect the flexible cable from the main board for the GL450/400.

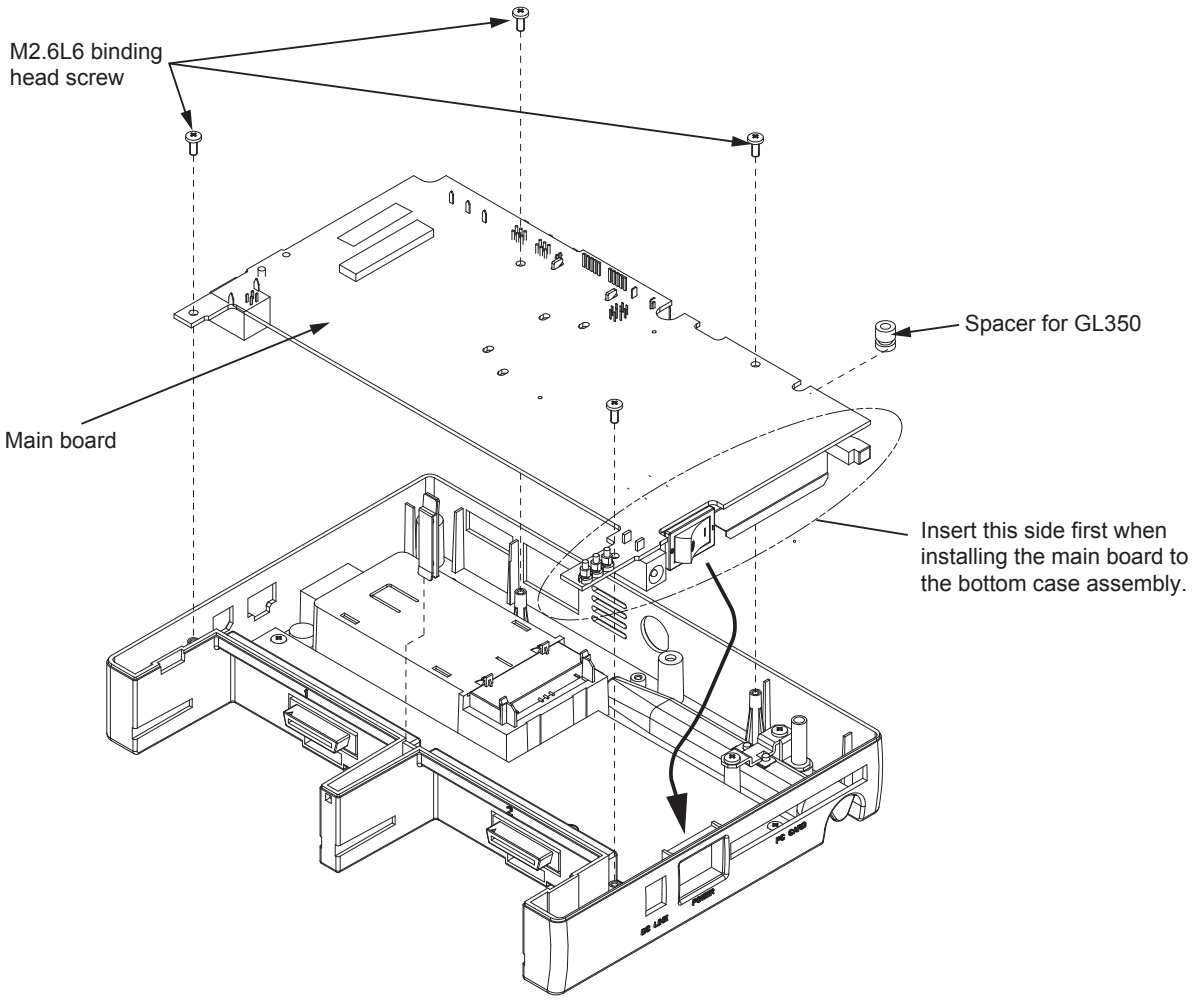
GL450/400



GL350


Top cover
Hook
Bottom case assembly
M3L30 binding
head screw
M3L10 self tapping screw

(5) Remove the four M2.6L6 binding head screws holding the main board and the remove the main board from the bottom case assembly.



Re-assembly

(1) Re-assemble the main board in the reverse order in which it was disassembled.

(2) Set up the GL450/400/350 when you replace any of the boards.

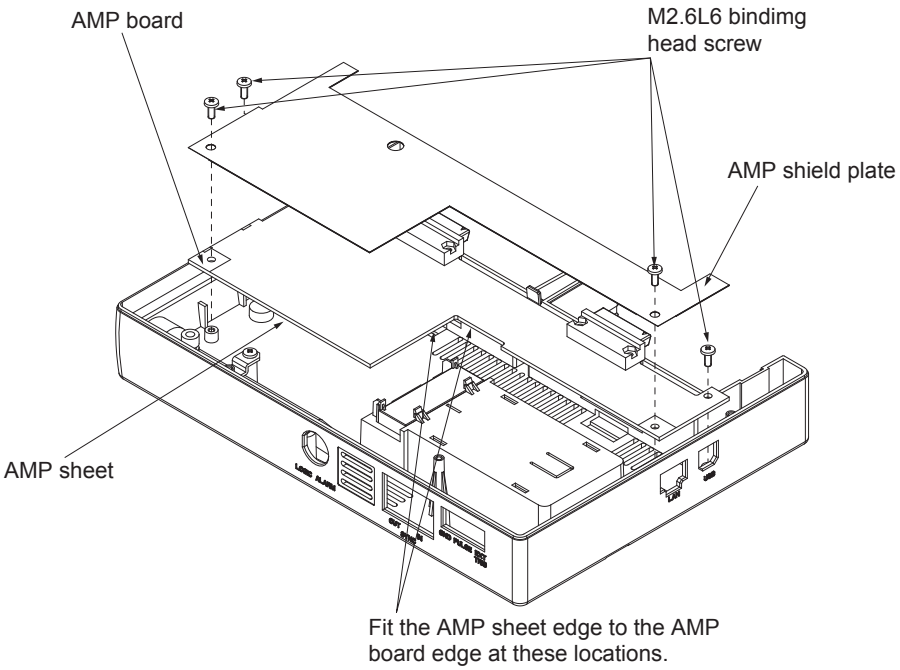
3.4 Replacing the AMP Board

Disassembly

(1) Remove the input terminal unit from the GL450/400/350 (See Section 3.2.).

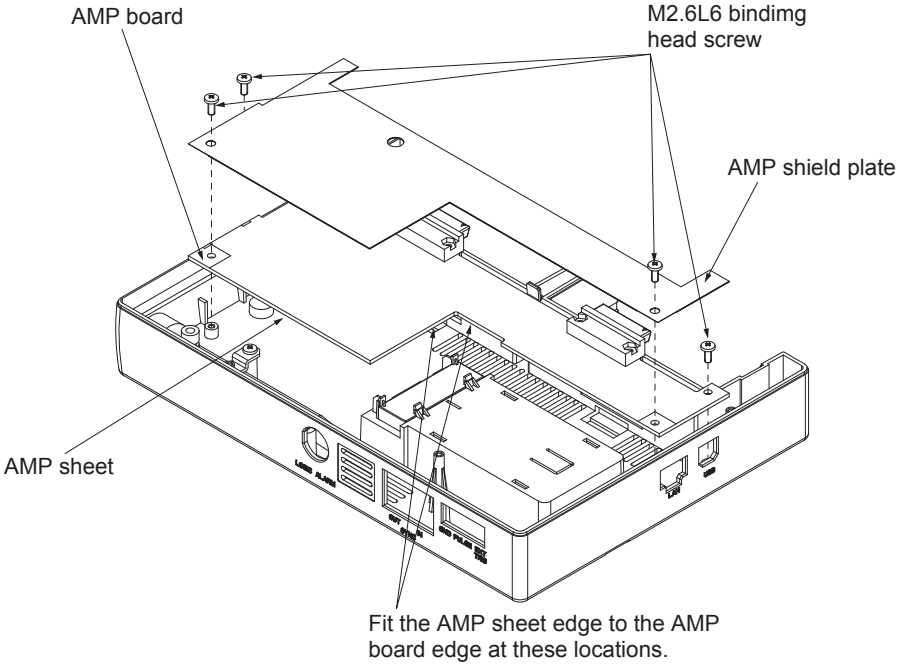
(2) Remove the main board from the bottom case (See Section 3.3.).

(3) Remove the four M2.6L6 binding head screws holding the AMP shield plate and the AMP board, and then detach the AMP board from the bottom case assembly.

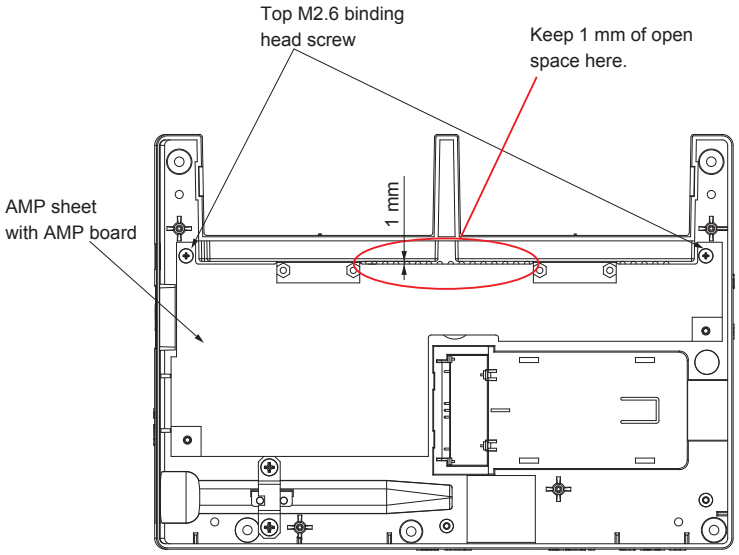


Re-assembly

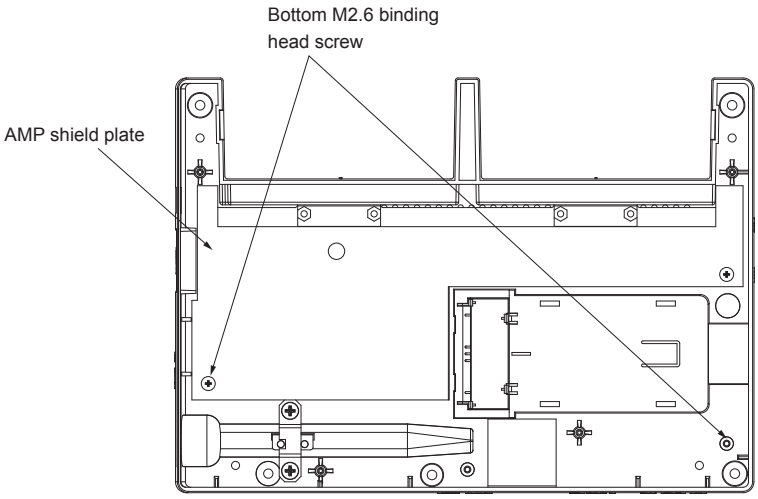
(1) Fit the AMP sheet edge to the AMP board edge as shown below and install it to the bottom case assembly.



(2) Tighten the top two M2.6 binding head screws as shown below.
At this stage, keep 1 mm of open space as shown below.



(3) Install the AMP shield plate, and then tighten the bottom two M2.6 binding head screws as shown below.



(4) Re-assemble the other parts in the reverse order in which they were disassembled.

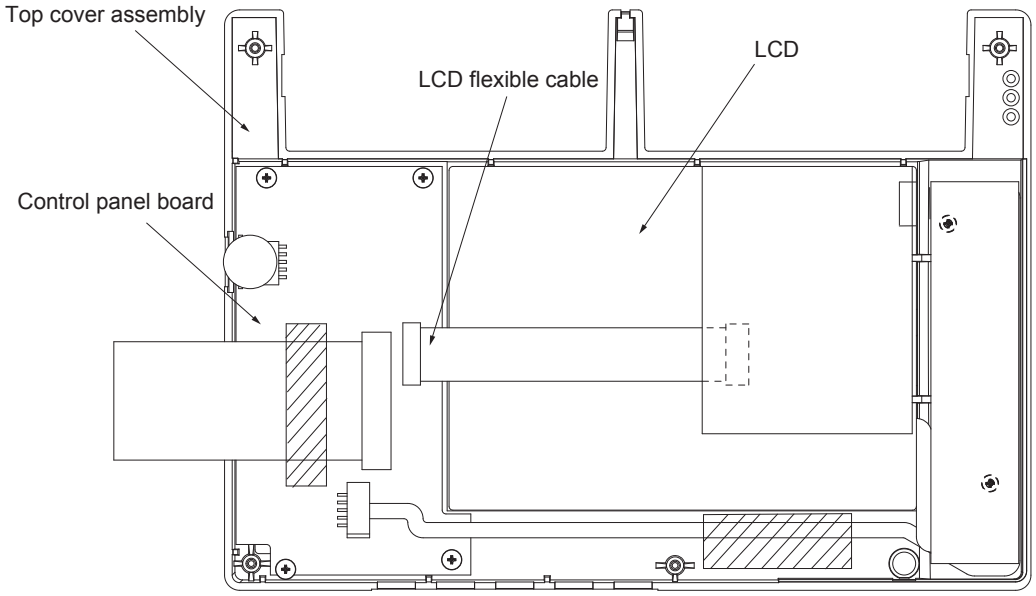
(5) Set up the GL450/400/350 when you replace any of the boards.

3.5 Replacing the LCD (GL450/400 only)

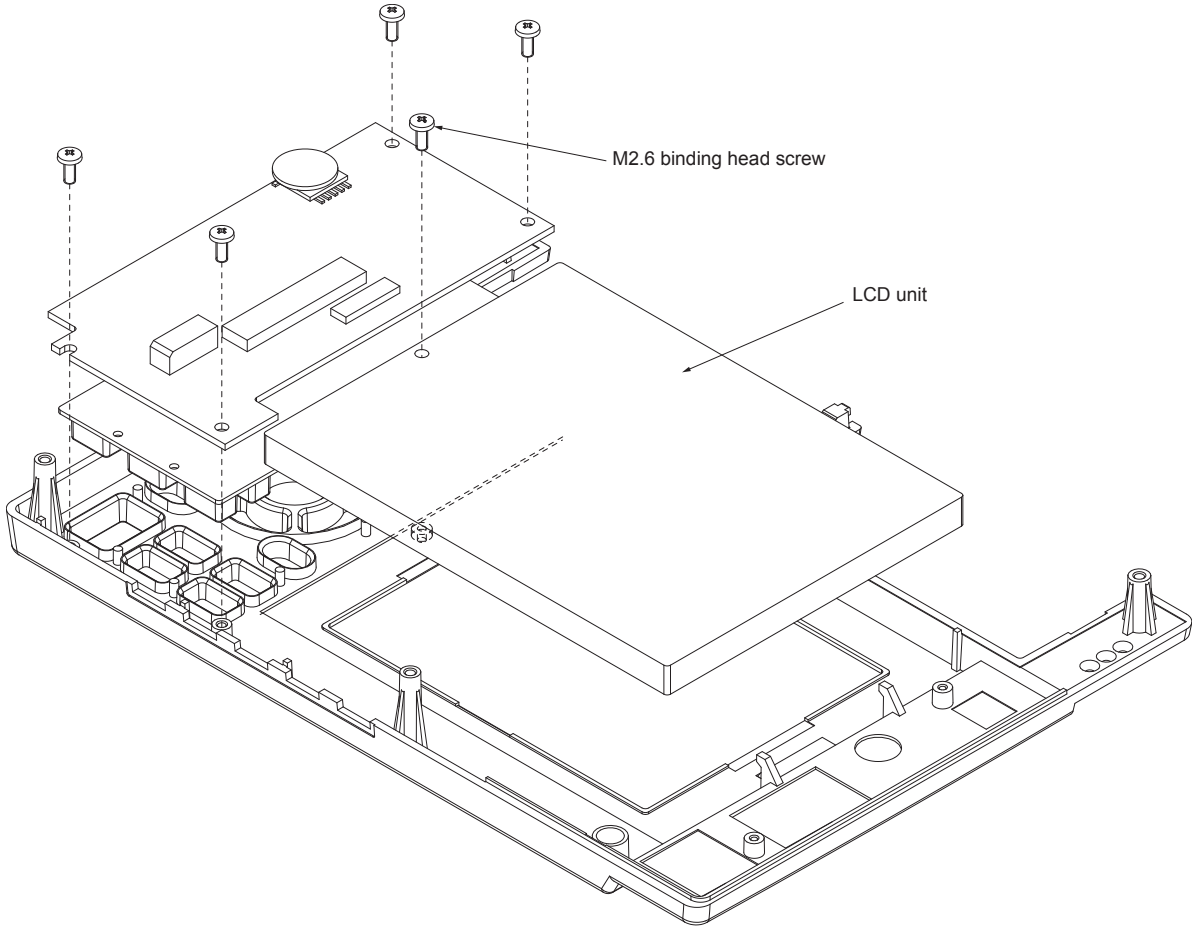
Disassembly

(1) Remove the input terminal unit from the GL450/400 (See Section 3.2.).

(2) Disconnect the LCD flexible cable from the control panel board.



(3) Remove the one M2.6 binding head screw holding the LCD unit, and then detach the LCD unit.



Re-assembly

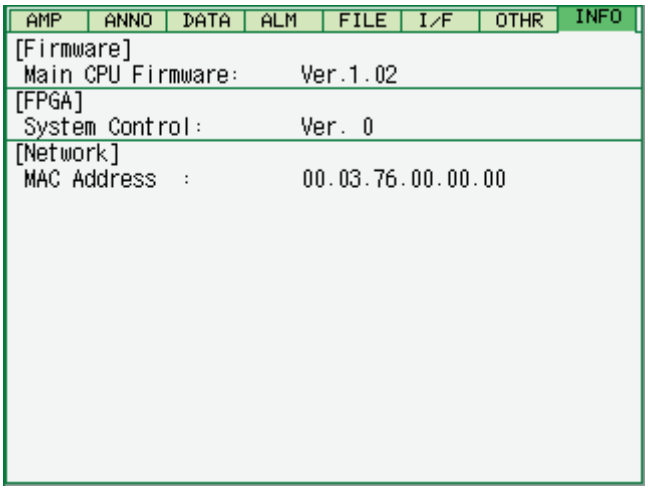
(1) Re-assemble the LCD unit in the reverse order in which it was disassembled.

4. SETUP PROCEDURES

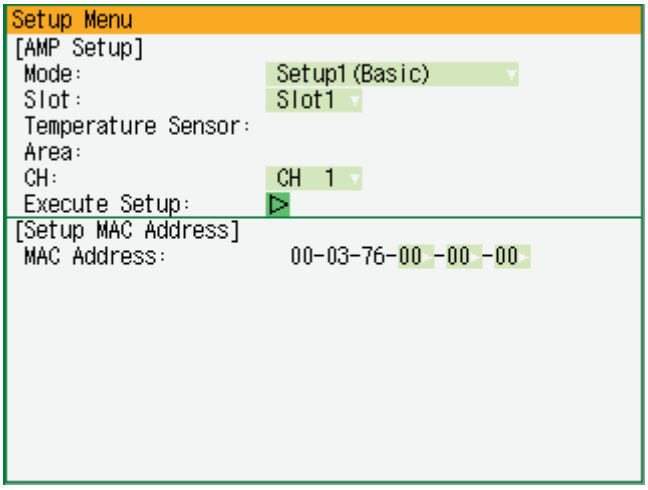
Note:
You need the GL400 top cover assembly as a setup jig for the GL350 when you set up the GL350.

4.1 Entering the System Setup Menu

(1) Press the [MENU] key, and then press the [Right Direction] key until the “INFO” menu shown below appears.



(2) Press the [UP Direction] key 10 times in order to display the “SET UP” menu shown below.



(3) Move the cursor to the “Mode” position using the [Direction] keys.

(4) Press the [ENTER] key to display the menu below from which you can execute the various Setup operations.

Setup mode
Setup1 (Basic)
Setup2 (Room temp.)
Setup3 (RTD temp)

(5) Select the Setup mode using the [Direction] keys, and then press the [ENTER] key.

(6) Move the cursor to the “Execute Setup” position as shown above.

(7) Press the [ENTER] key to start the selected Setup operation.

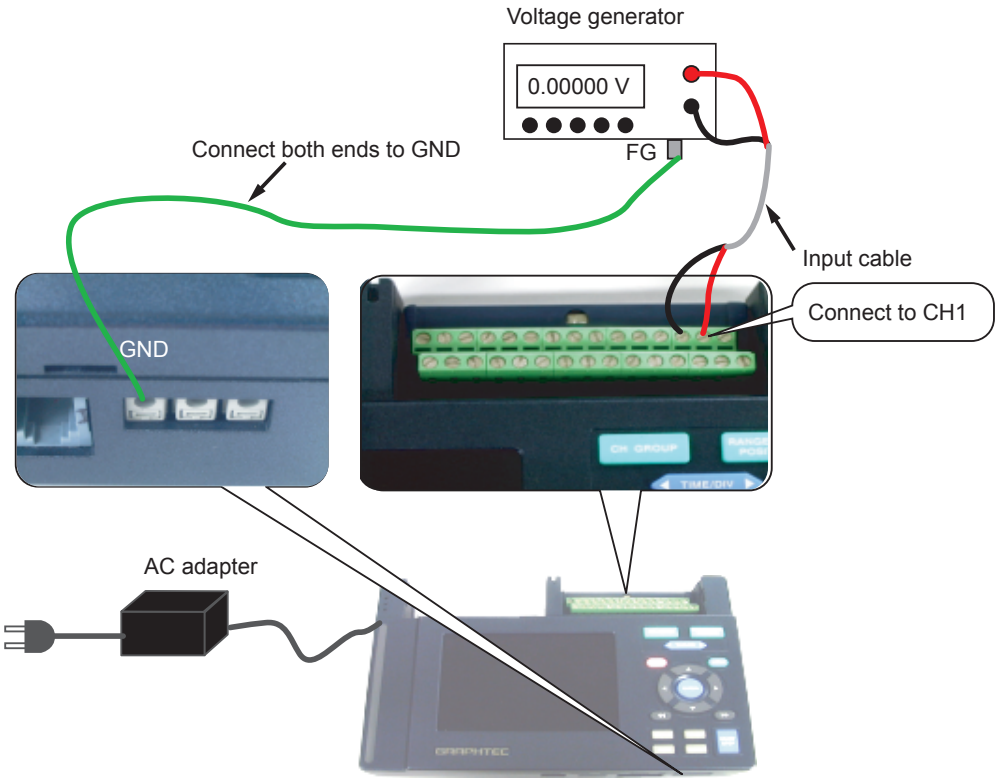
4.2 Setting Up Setup1 (Voltage Input)

This procedure is required when any part of the AMP board is replaced

Preparation

- Have a voltage generator on hand that can output voltage up to 50 VDC (four-digit output).
- Mutually connect the ground terminals of the voltage generator and the GL450/400/350.

Wiring connection



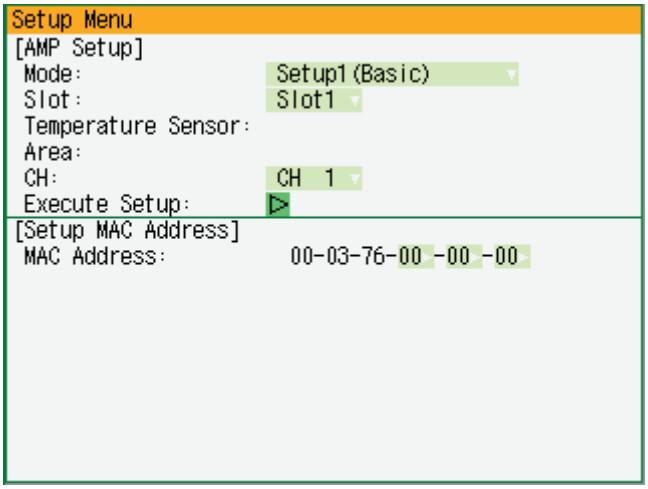
Setup procedure

(1) As shown in the figure above, connect the output of the voltage generator to the GL400/350's input terminal.

(2) Leave the GL450/400/350 turned on for at least 10 minutes.

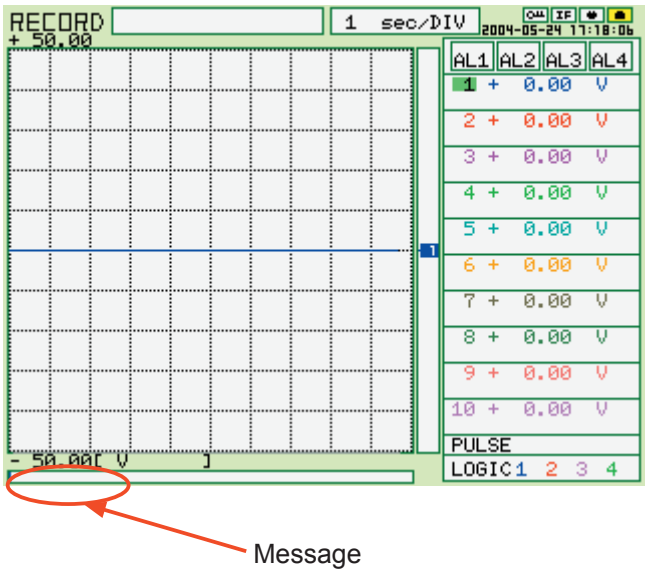
(3) After entering the System Setup mode, open the Setup menu as shown below.
Specify the AMP Setup conditions as shown below.

Mode :Setup1 (Basic)
Slot :Slot1
CH :CH 1



(4) Move the cursor to the “Execute Setup” position as shown above.

(5) Press the [ENTER] key to start the Setup1 (Basic) operation.



(6) The “GND : [START]” message is displayed at the location shown above.

(7) Input “0.000mV” to the input terminals of channel 1.

(8) Press the [START] key and then wait until the "20 mV : [START]" message appears.
Specify the voltage generator's output voltage setting to correspond to one of the displayed voltage ranges in the following table, and then input that voltage to the GL450/400/350.

Message	Input Voltage
GND	0.000 mV
20 mV	20.000 mV
50 mV	50.000 mV
100 mV	100.000 mV
200 mV	200.000 mV
500 mV	500.000 mV
1 V	1.000 V
2 V	2.000 V
5 V	5.000 V
10 V	10.000 V
20 V	20.000 V
50 V	50.000 V

(9) Repeat step (8) by sequentially setting the Measure parameter to 50 mV, 100 mV, 200 mV, 500 mV, 2 V, 5 V, 10 V, 20 V and 50 V, and then inputting the corresponding voltage.

(10) When you have finished the Setup operation for 50 V, the "EEPROM : [ENTER]" message appears. Press the [ENTER] key to begin writing the new Setup data to the EEPROM.

(11) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(12) Turn off the GL450/400/350.

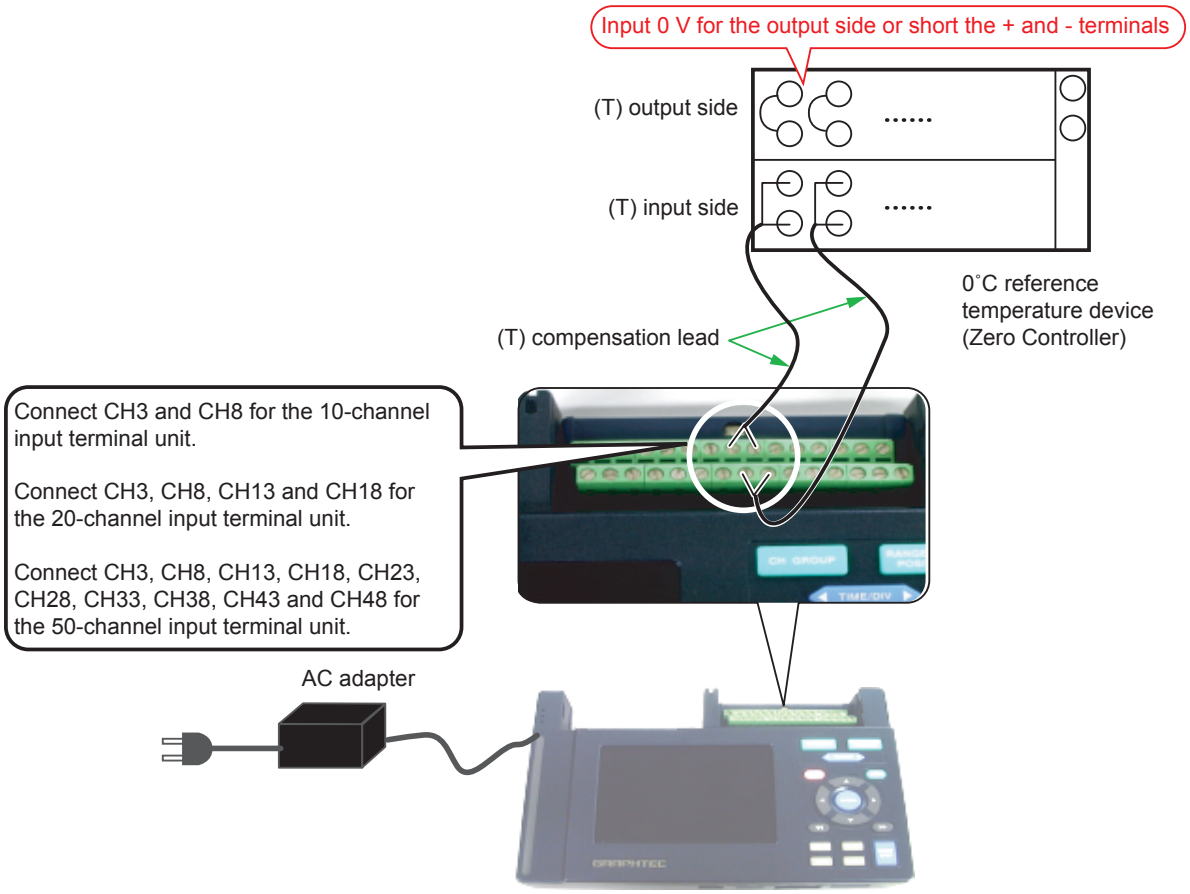
This completes the voltage amp setup.

4.3 Setup2 (Room Temperature Compensation)

Preparation

As shown below, use (T) temperature compensation leads to connect the target amps to the 0˚C reference temperature device (Zero controller). Also be sure to use (T) temperature compensation leads to connect the input terminal.

Wiring connection


Input 0 V for the output side or short the + and - terminals
(T) output side
(T) input side
0˚C reference temperature device (Zero Controller)
(T) compensation lead
Connect CH3 and CH8 for the 10-channel input terminal unit.
Connect CH3, CH8, CH13 and CH18 for the 20-channel input terminal unit.
Connect CH3, CH8, CH13, CH18, CH23, CH28, CH33, CH38, CH43 and CH48 for the 50-channel input terminal unit.
AC adapter

CAUTION

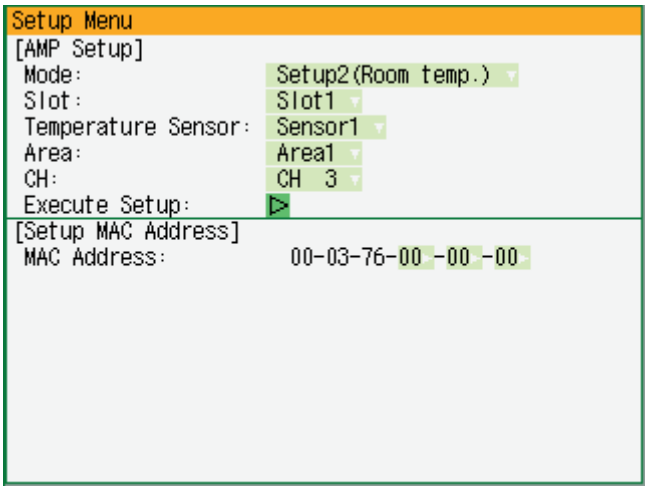
Connect each compensation copper lead to a single terminal as shown in the above diagram (parallel wiring is not permitted).

(1) As shown in the figure above, connect the input of the zero controller to the GL450/400/350's input terminal.

(2) Leave the GL450/400/350 turned on for at least 10 minutes.

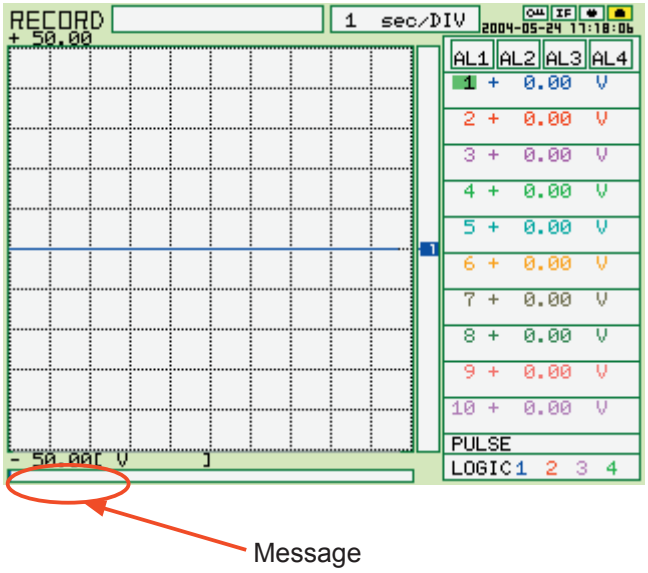
(3) After entering the System Setup mode, open the Setup menu as shown below.
Specify the AMP Setup conditions as shown below.

Mode	:Setup2 (Room temp.)
Slot	:Slot1
Temperature Sensor	:Sensor1
Area	:Area1
CH	:CH 3



(4) Move the cursor to the “Execute Setup” position as shown above.

(5) Press the [ENTER] key to start the Setup2 (Room temp.) operation.



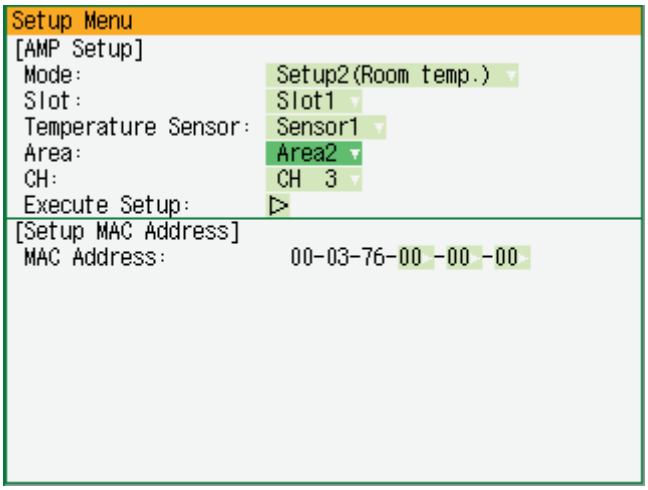
(6) The “rTemp : [START]” message is displayed at the location shown above.

(7) Press the [START] key and then wait until the "EEPROM : [ENTER]" message appears.

(8) Press the [ENTER] key to begin writing the new Setup data to the EEPROM.

(9) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(10) Re-open the Setup menu as shown below.
Specify the AMP Setup conditions as shown below.
Mode :Setup2 (Room temp.)
Slot :Slot1
Temperature Sensor :Sensor1
Area :Area2
CH :CH 3



(11) Repeat steps (4) to (8) for Area2 of Sensor1.

(12) If you have the 20-channel input terminal unit, repeat steps (4) to (8) for Sensor2.

(13) If you have the 50-channel input terminal unit, repeat steps (4) to (8) until Area 5 of Sensor2.

(14) Turn off the GL450/400/350.

This completes the Room temp. setup.

Setup flow for the Room temp.

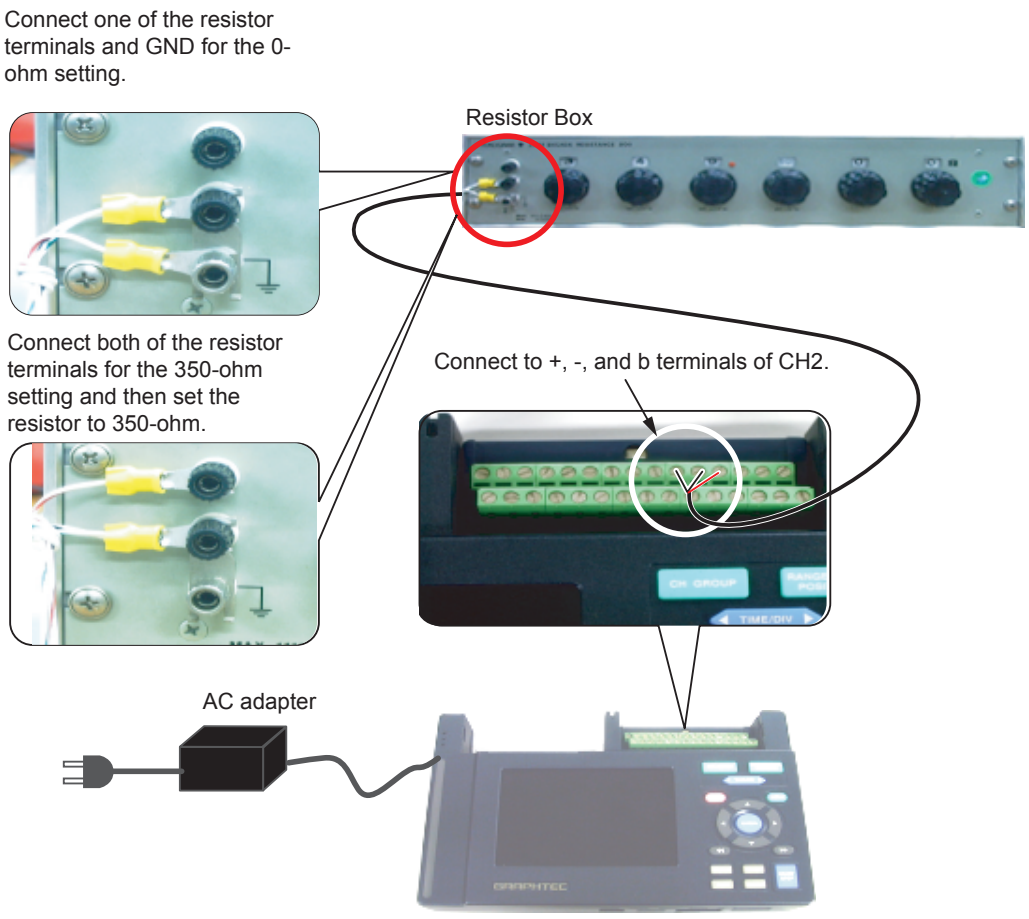
Procedure	10-channel input terminal	20-channel input terminal	50-channel input terminal
1	Sensor 1 Area 1	Sensor 1 Area 1	Sensor 1 Area 1
2	Sensor 1 Area 2	Sensor 1 Area 2	Sensor 1 Area 2
3	None	Sensor 2 Area 1	Sensor 1 Area 3
4	None	Sensor 2 Area 2	Sensor 1 Area 4
5	None	None	Sensor 1 Area 5
6	None	None	Sensor 2 Area 1
7	None	None	Sensor 2 Area 2
8	None	None	Sensor 2 Area 3
9	None	None	Sensor 2 Area 4
10	None	None	Sensor 2 Area 5

4.4 Setting Up Setup3 (RTD Temp.)

Preparation

As shown below, use a resistor box.

Wiring connection

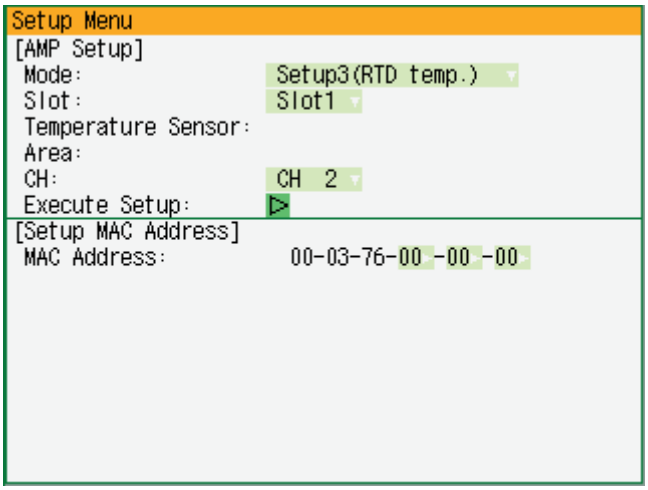

Connect one of the resistor terminals and GND for the 0-ohm setting.
Resistor Box
Connect both of the resistor terminals for the 350-ohm setting and then set the resistor to 350-ohm.
Connect to +, -, and b terminals of CH2.
AC adapter

Setup procedure

(1) Connect the resistor box and the GL450/400/350 for the 0-ohm setting as shown above.

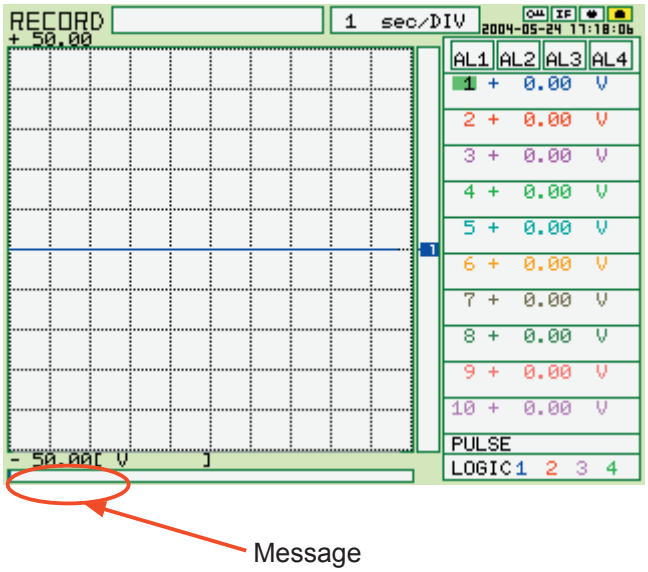
(2) Leave the GL450/400/350 turned on for at least 10 minutes.

(3) After entering the System Setup mode, open the Setup menu as shown below.
Specify the AMP Setup conditions as shown below.
Mode :Setup3 (RTD temp.)
Slot :Slot1
CH :CH 2



(4) Move the cursor to the “Execute Setup” position as shown above.

(5) Press the [ENTER] key to start the Setup3 (RTD temp.) operation.



(6) The “0 ohm : [START]” message is displayed at the location shown above.

(7) Input “0 ohm” to the input terminals.

(8) Press the [START] key and then wait until the "350 ohm : [START]" message appears.

(9) Connect the resistor box and the GL450/400/350 for the 350-ohm setting as shown above.

(10) Specify the resistor box's setting to 350 ohm.

(11) Press the [START] key.

(12) When you have finished the 350-ohm Setup operation, the "EEPROM : [ENTER]" message appears. Press the [ENTER] key to begin writing the new Setup data to the EEPROM.

(13) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(14) Turn off the GL450/400/350.

This completes the RTD temp. setup.

5. INSPECTION AND CHECK PROCEDURES

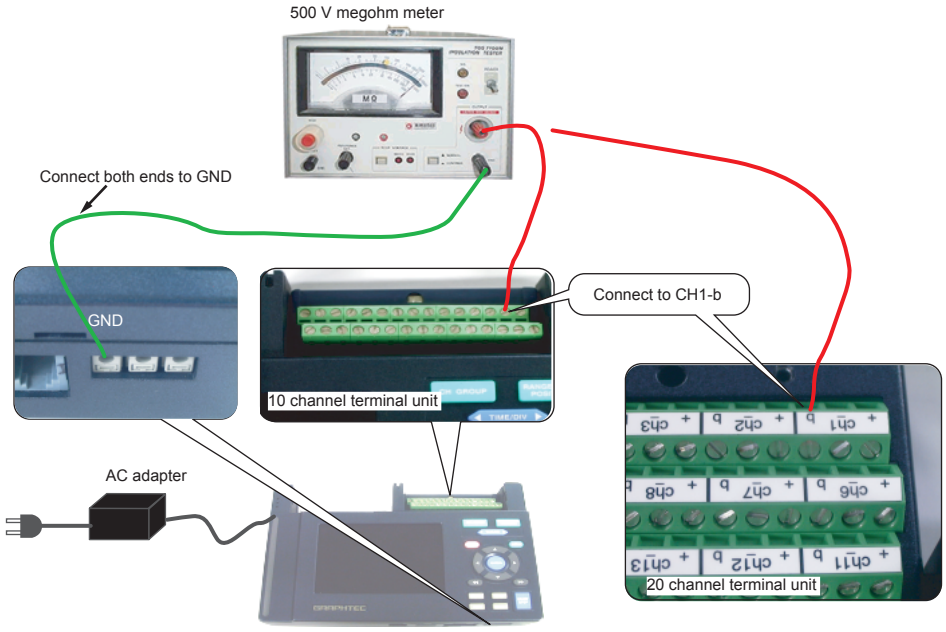
Note:
You need the GL400 top cover assembly as a setup jig for the GL350 when you inspect the GL350.

5.1 Insulation Resistance

Use a megohm meter (an insulation resistance gauge) to check that the insulation resistance between the following terminals is equal to or higher than the rated value.

Measuring Terminals	Rated value	Remark
Ch1-b to GND (FG)	Megohm meter with an output capacity of 500 VDC, insulation resistance is 50 M ohm or more.	1 channel

Wiring connection



5.2 Inspection and Check Methods

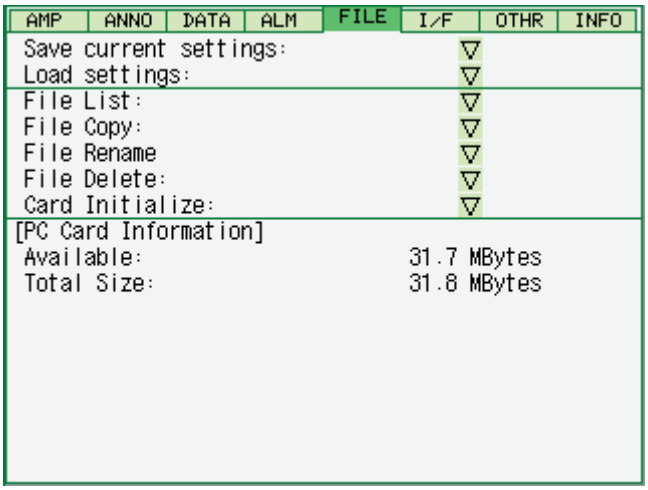
Preparations for inspections and checks

Condition settings files	:CondVolt.CND	← Condition settings for measurement accuracy
	:CondT.CND	← Condition settings for the T range accuracy (for the 10-Ch and 20-Ch terminal unit)
	:CondT50-1.CND	← Condition settings for the T range accuracy (for ch3, 8, ,13, 18, 23 of the 50-Ch terminal unit)
	:CondT50-2.CND	← Condition settings for the T range accuracy (for ch23, 28, 33, 38, 48 of the 50-Ch terminal unit)
	:CondK.CND	← Condition settings for the K range accuracy (for the 10-Ch and 20-Ch terminal unit)
	:CondK50-1.CND	← Condition settings for the K range accuracy (for ch3, 8, ,13, 18, 23 of the 50-Ch terminal unit)
	:CondK50-2.CND	← Condition settings for the K range accuracy (for ch23, 28, 33, 38, 48 of the 50-Ch terminal unit)
	:CondRTD.CND	← Condition settings for the RTD accuracy
	:CondNoise.CND	← Condition settings for the noise ratio

(1) Copy the five condition settings files to a PCMCIA card from the computer.

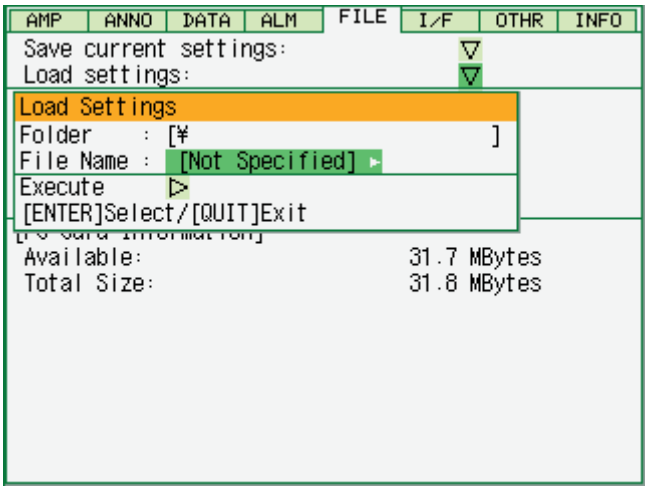
How to load the condition settings files to the GL450/400/350 from a PCMCIA card

(1) Press the [MENU] key, and then press the [Right Direction] key until the “FILE” menu shown below appears.



(2) Move the cursor to the “Load settings” position using the [Direction] keys.

(3) Press the [ENTER] key to display the menu below.



(4) Specify the condition settings file to execute the various inspection operations.

(5) Move the cursor to the “Execute” position using the [Direction] keys.

(6) Press the [ENTER] key to load the condition settings file.

5.2.1 Measurement Accuracy

Supply the reference voltage or frequency determined for each measurement range, and then check the voltage accuracy.

Preparation

- Use a voltage generator that can output up to 50 VDC (using four-digit settings).
- Mutually connect the ground terminals of the voltage generator and the GL450/400/350 prior to initiating measurement.

Wiring connection

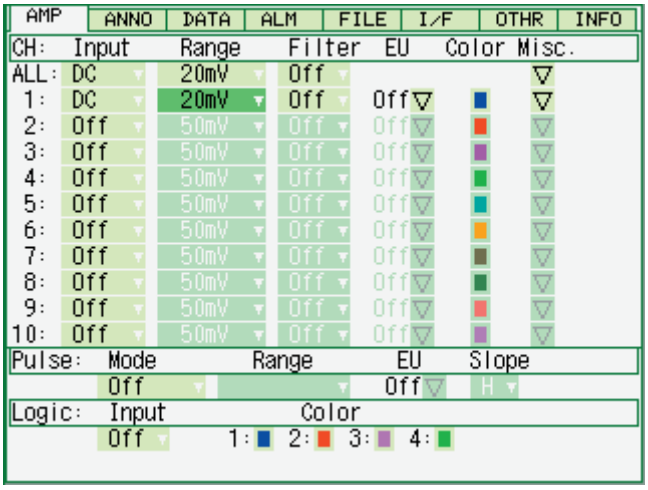
Same wiring connection as Setup1. (See Setup1 procedure)

Setting procedure

(1) Load the condition settings file "CondVolt.CND" from the PCMCIA card.

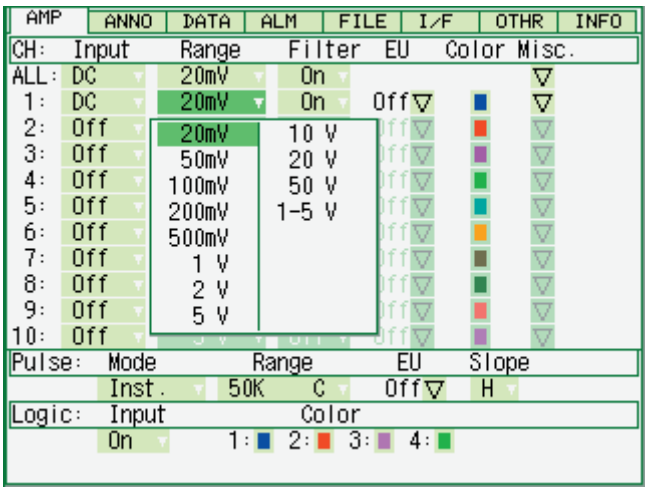
Measurement procedure

(1) Press the [MENU] key to display the menu shown below.

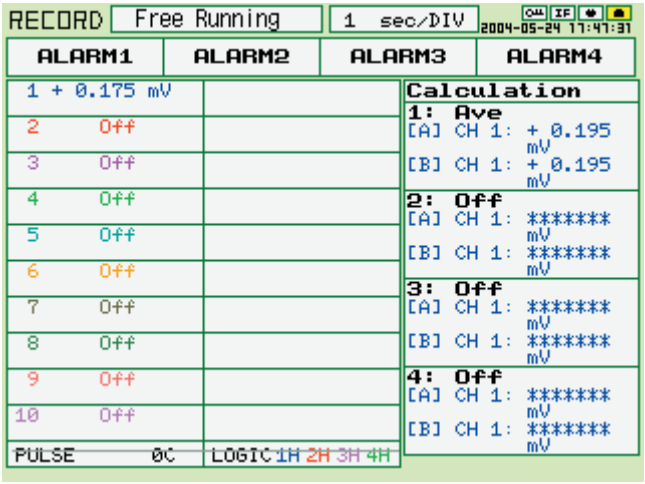


(2) Move the cursor to the Range position of channel 1 as shown above.

(3) Press the [ENTER] key to display the menu shown below, and then select the reference voltage range.



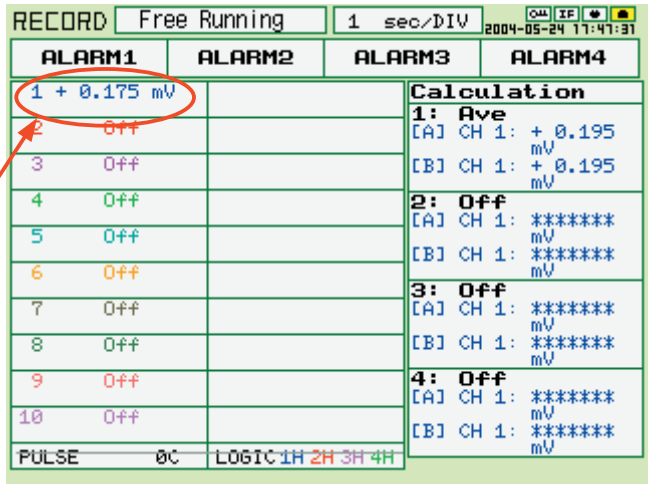
(4) Press the [DISPLAY] key until the menu shown below appears.



(5) Input the reference voltage for each range according to the table below, and then check that the level of measurement is within the rating.

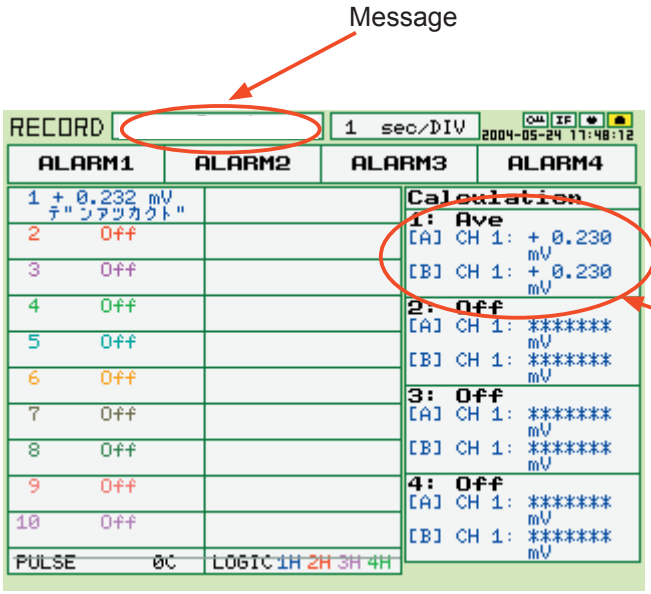
Voltage precision ratings		
Range	Input voltage	Rating
20 mV	+20.000 mV	+19.984 mV to +20.016 mV
50 mV	+50.000 mV	+49.96 mV to +50.04 mV
100 mV	+100.00 mV	+99.92 mV to +100.08 mV
200 mV	+200.00 mV	+199.84 mV to +200.16 mV
500 mV	+500.00 mV	+499.6 mV to +500.4 mV
1 V	+1.0000 V	+0.9992 V to +1.0008 V
2 V	+2.0000 V	+1.9984 V to +2.0016 V
50 V	+50.000 V	+49.96 V to +50.04 mV

This value will change when the reference voltage is input from the voltage generator.



(6) Press the [START/STOP] key when the input voltage stabilizes.

(7) Wait until the "Finished" message is displayed, and then display the values as shown below.



Confirm that this value is within the above ratings after data has been captured.

The data with an automatically generated file name is captured to the PCMCIA card

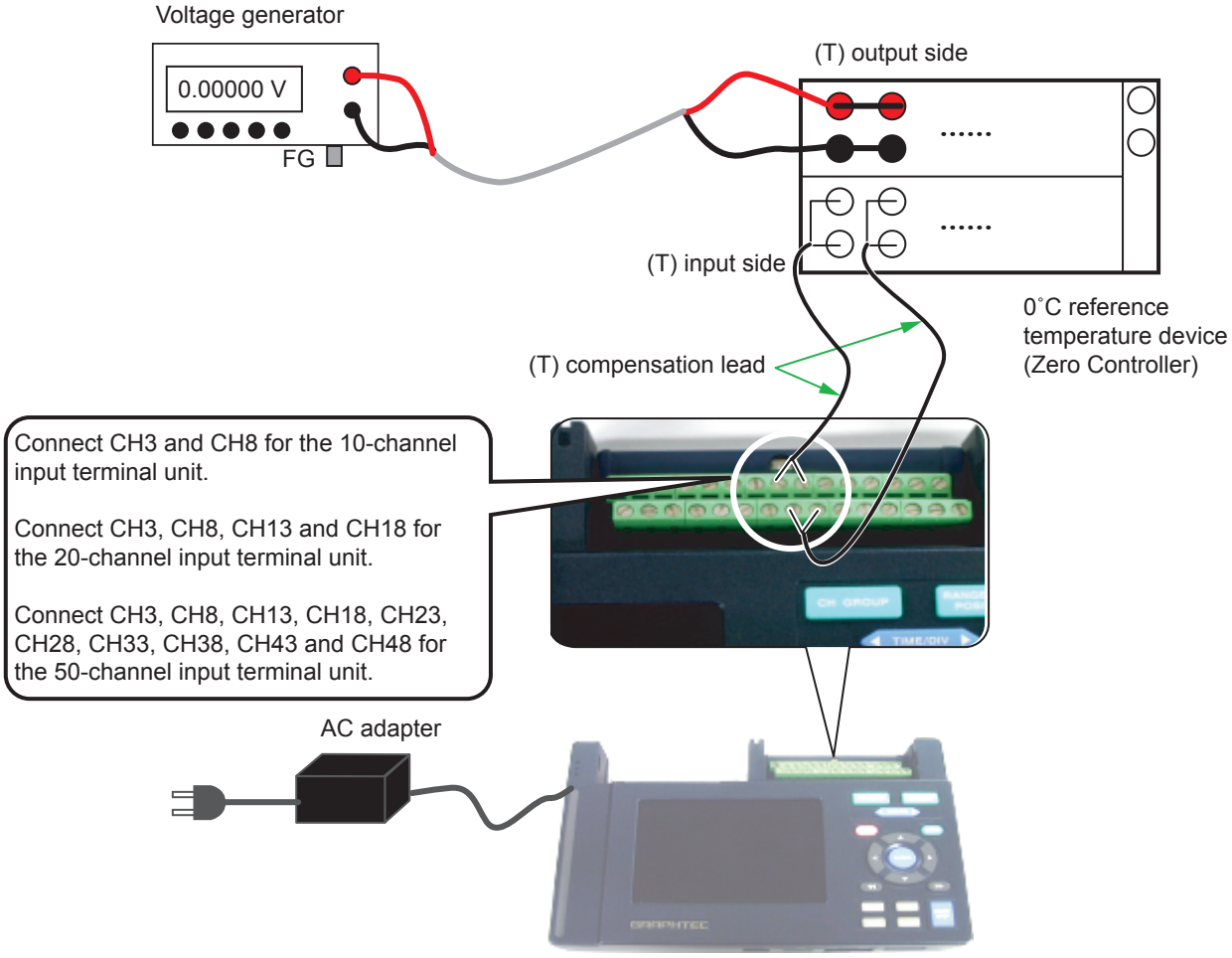
(8) Repeat steps (1) to (7), and then confirm that each value is within the above ratings.

5.2.2 Temperature Accuracy

Preparation

- Use (T) temperature compensation leads to connect the target amp and a 0˚C reference temperature device (zero controller) as shown below.
- As shown below, use copper leads to connect the 0˚C reference temperature device (zero controller) to a voltage generator that can specify output up to 1µV.

Wiring connection


Voltage generator
0.00000 V
FG
(T) output side
(T) input side
0˚C reference temperature device (Zero Controller)
(T) compensation lead
Connect CH3 and CH8 for the 10-channel input terminal unit.
Connect CH3, CH8, CH13 and CH18 for the 20-channel input terminal unit.
Connect CH3, CH8, CH13, CH18, CH23, CH28, CH33, CH38, CH43 and CH48 for the 50-channel input terminal unit.
AC adapter

Note : The compensation leads should be connected individually. Do not connect in parallel. Connect the FG of the voltage generator and the AC adapter.

Setting procedure

(1) Load the condition settings files from the PCMCIA card.

Condition settings files
:CondT.CND ← Condition settings for the T range accuracy (for the 10-Ch and 20-Ch terminal unit)
:CondT50-1.CND ← Condition settings for the T range accuracy (for ch3, 8, ,13, 18, 23 of the 50-Ch terminal unit)
:CondT50-2.CND ← Condition settings for the T range accuracy (for ch23, 28, 33, 38, 48 of the 50-Ch terminal unit)
:CondK.CND ← Condition settings for the K range accuracy (for the 10-Ch and 20-Ch terminal unit)
:CondK50-1.CND ← Condition settings for the K range accuracy (for ch3, 8, ,13, 18, 23 of the 50-Ch terminal unit)
:CondK50-2.CND ← Condition settings for the K range accuracy (for ch23, 28, 33, 38, 48 of the 50-Ch terminal unit)

Measurement procedure (temperature accuracy)

(1) Load the condition settings file for type T as described above.

(2) Connect to the zero controller with the (T) compensation leads.

(3) Use the voltage generator to successively input the reference voltage signal for each range to the 0˚C reference temperature device (zero controller) according to the table below, then check that the level of measurement is within the rating.

Input voltage precision ratings (Type T)		
Temperature	Input voltage	Standard
0 ˚C	0.000 mV	-1.0 ˚C to +1.0 ˚C
200 ˚C	9.288 mV	198.8 ˚C to 201.2 ˚C
390 ˚C	20.255 mV	388.7 ˚C to 391.3 ˚C
-200 ˚C	-5.603 mV	-197.8 ˚C to -202.2 ˚C

(4) Connect (K) compensation leads to each amp.

(5) Load the condition settings file for type K as described above.

(6) Input the reference voltage signal for each range to the 0˚C reference temperature device (zero controller) according to the table below, then check that the level of measurement is within the rating.

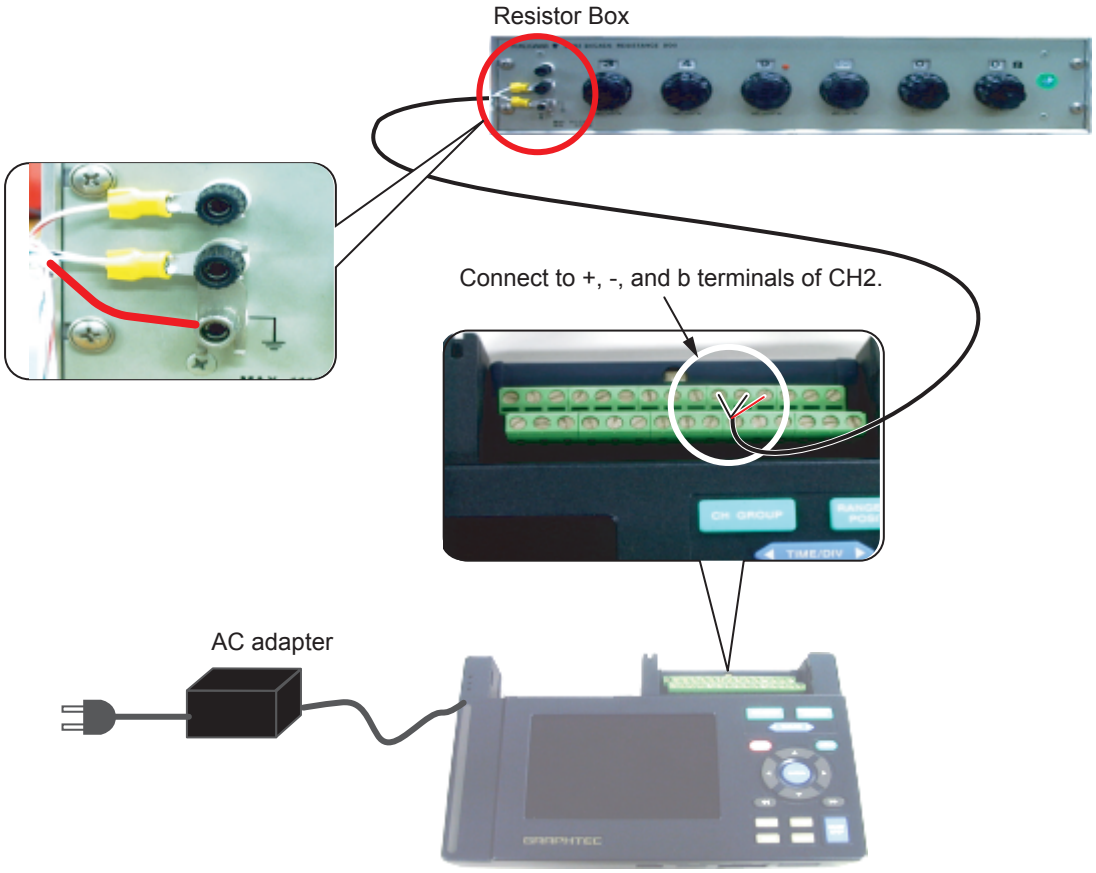
Input voltage precision ratings (Type K)		
Temperature	Input voltage	Standard
0 ˚C	0.000 mV	-1.5 ˚C to +1.5 ˚C
1200 ˚C	48.838 mV	1197.9 ˚C to 1202.1 ˚C
-190 ˚C	-5.730 mV	-187.5 ˚C to -192.5 ˚C

5.2.3 RTD Accuracy

Preparation

As shown below, use leads to connect the target amps to the resistor box.

Wiring connection



Measurement procedure (RTD accuracy)

(1) Load the condition settings file CondRTD.CND as described above.

(2) As shown in the figure above, connect the output of the resistor box to the GL450/400/350's input terminal.

(3) Use the resistor box to successively set the reference resistance for each range according to the table below, then check that the level of measurement is within the rating.

Input resistor precision ratings		
Temperature	Resistance value	Standard
0 ˚C	100 ohm	-0.5 ˚C to +0.5 ˚C
400 ˚C	247.09 ohm	399.3 ˚C to 400.7 ˚C
800 ˚C	375.51 ohm	799.2 ˚C to 800.8 ˚C
-190 ˚C	22.8 ohm	-189.4 ˚C to -190.6 ˚C

5.3 Signal-to-Noise Ratio

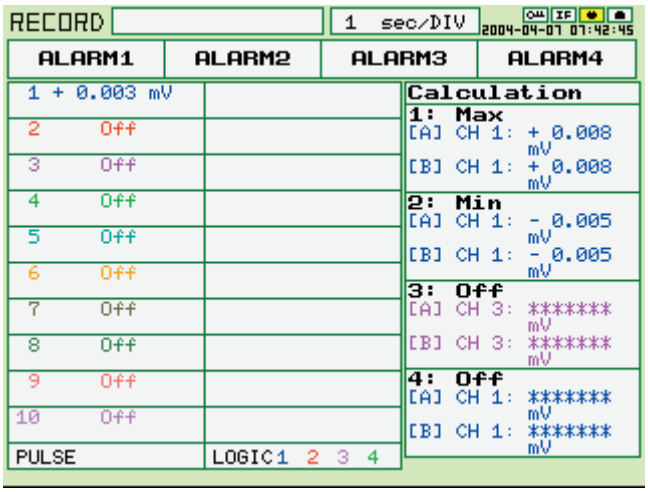
Preparation

Short the + and - terminals for channel 1.

Setting Procedure

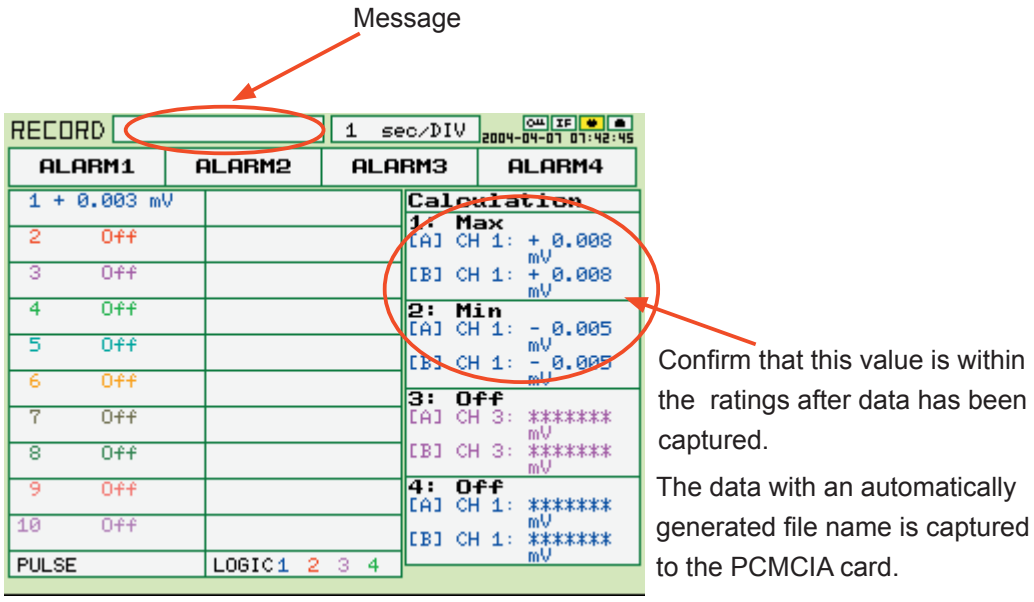
(1) Load the condition settings file CondNoise.CND as described above.

(2) Press the [DISPLAY] key until the menu shown below appears.



(3) Press the [START] key to start data capture.

(4) Wait until the "Finished" message is displayed, and then display the values as shown below.



(5) Confirm that the difference between the maximum and minimum values is within 0.06 mV.

6. PARTS LISTS

6.1 Recommended Parts List

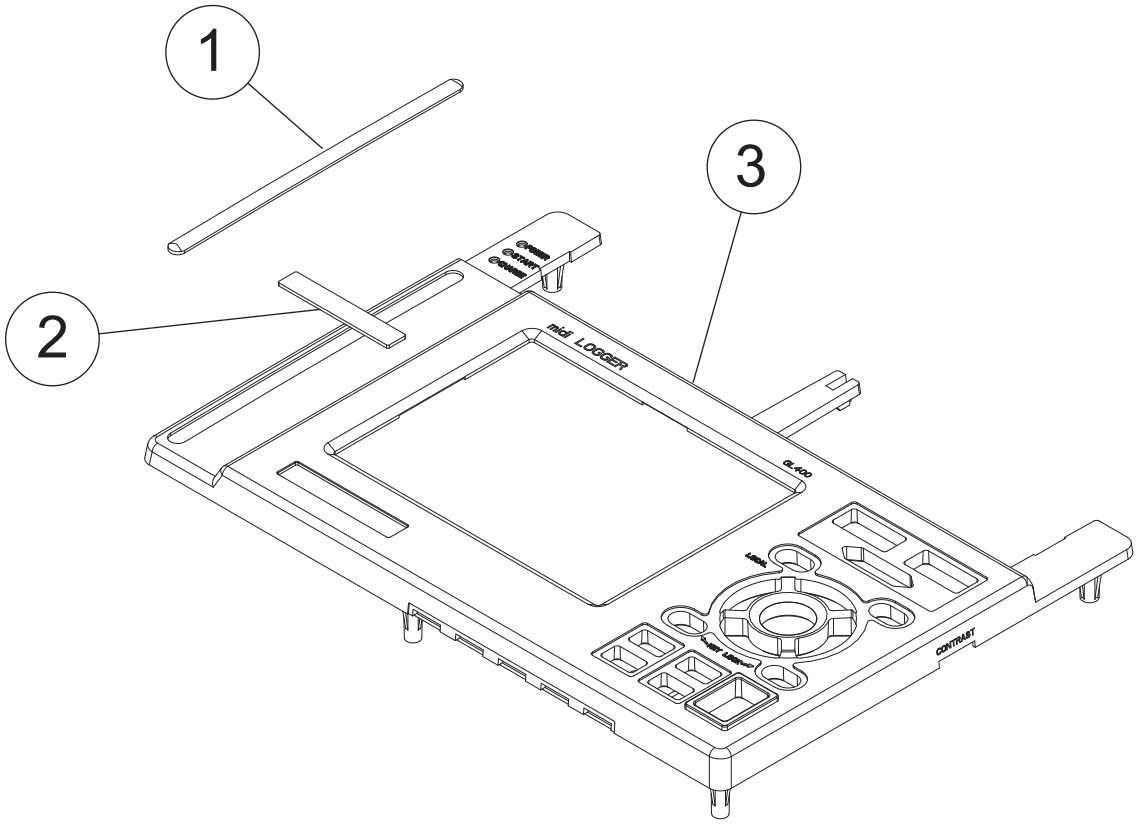
Part No.	Part Name	Description	Q'ty	Remarks
790435700	Main Control Board for GL400/350		1	GL400/350
795401700	Main Control Board for GL450		1	GL450
770435103	AMP Board		1	
795350310	10-ch Input Terminal Unit	10SU	1 or 2	GL400/350
795350320	20-ch Input Terminal Unit	20SU	1 or 2	GL400/350
795350370	50-ch Input Terminal Unit	50SU	1 or 2	GL400/350
795401110	10-ch Input Terminal Unit	10TU	1 or 2	GL450
795401120	20-ch Input Terminal Unit	20TU	1 or 2	GL450
795401150	50-ch Input Terminal Unit	50TU	1 or 2	GL450
500051951	AC Adapter	SA45-3129	1	
500052336	Battery Pack for GL400/350	CGR-B/242	1	GL400/350
795450004	Battery Pack for GL450		1	Same as GL500
500052301	LCD, KCG047QV1AA-A21		1	GL450/400
500052325	Inverter for LCD, CXA-K0505-VJL		1	GL450/400

6.2 Parts Lists

6.2.1 Top Cover, GL450/400

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	604400011	Rubber Grip		1	
2	604350950	Emblem Plate "GRAPHTEC"	EFBL-40	1	GL400
	604450040	Emblem Plate 450 "GRAPHTEC"	EFBL-40-GL450	1	GL450
3	604400020	Top Cover for GL400	Case top, LCD	1	GL400
	604450060	Top Cover for GL450	Case top 450, LCD	1	GL450

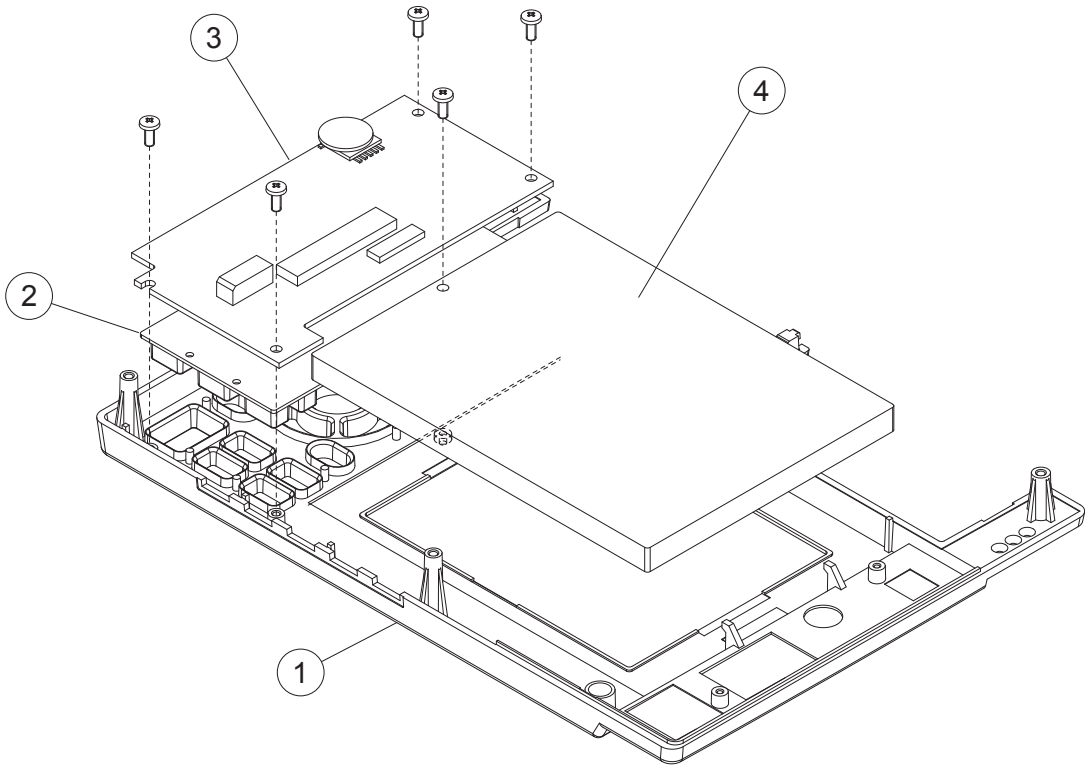
Top Cover, GL450/400



6.2.2 LCD & Key Panel, GL450/400

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	604400020	Top Cover for GL400	Case top, LCD	1	GL400
	604450060	Top Cover for GL450	Case top 450, LCD	1	GL450
2	604400004	Key Switch		1	
3	770435105	Control Panel Board		1	GL400
	795401701	Control Panel Board 450		1	GL450
4	500052301	LCD	KCG047QV1AA-21	1	

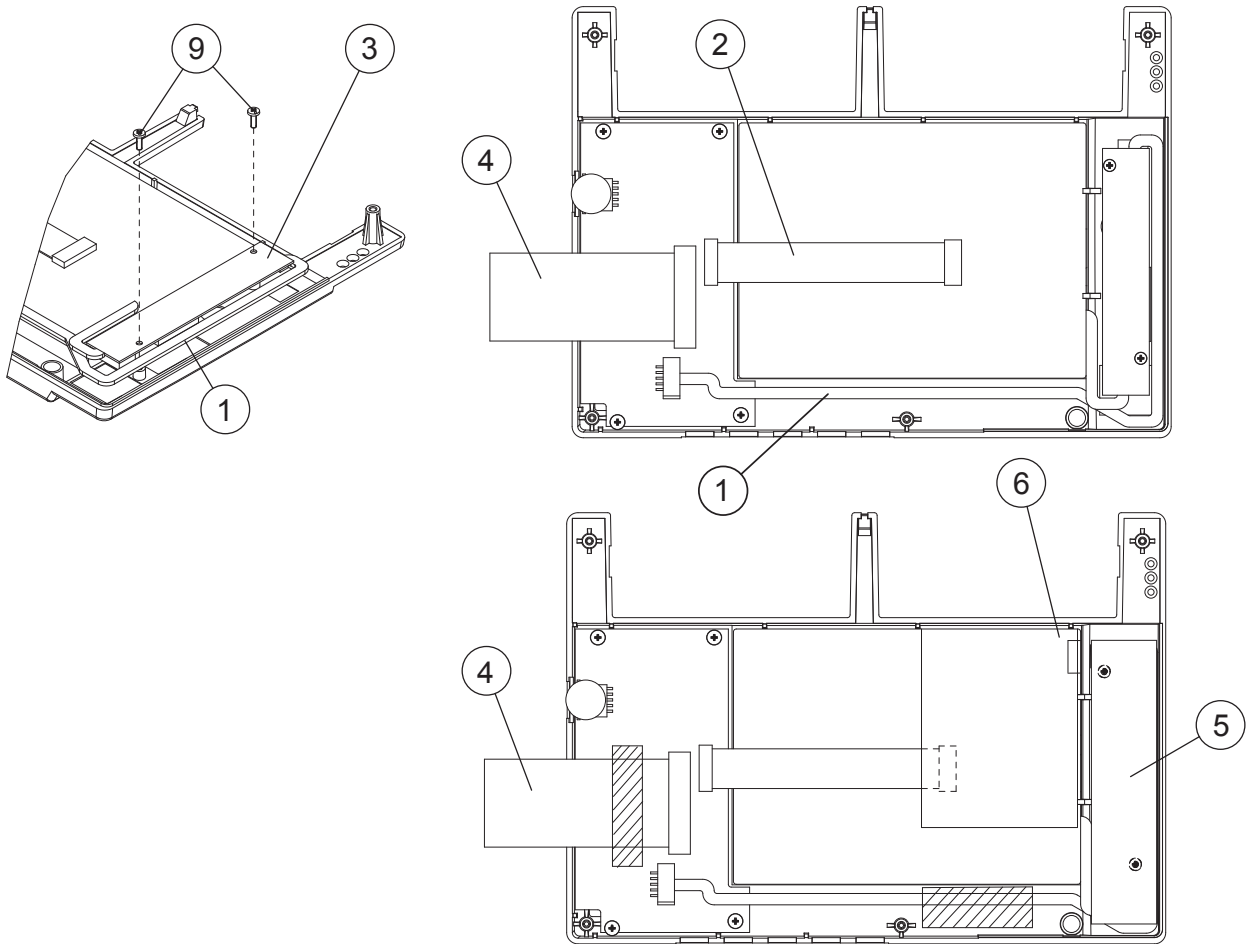
LCD & Key Panel, GL450/400



6.2.3 Top Cover, Reverse Side, GL450/400

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	690440031	Cable, GL400-03		1	
2	690440040	Cable, GL400-04		1	
3	500052325	Inverter, CXA-K0505-VJL		1	
4	690440020	Flexible Cable, GL400-02		1	
5	604400070	Inverter Insulating Sheet		1	
6	604400060	LCD Insulating Sheet		1	

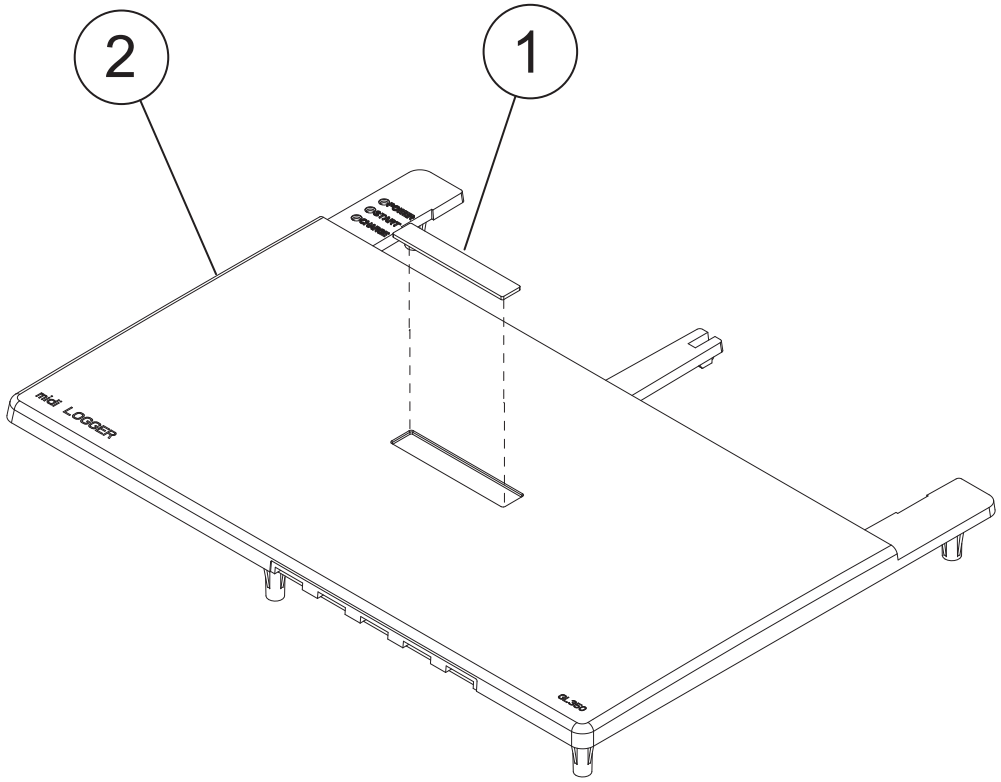
Top Cover, Reverse Side, GL450/400



6.2.4 Top Cover, GL350

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	604350950	Emblem Plate "GRAPHTEC"	EFBL-40	1	
2	604350040	Top Cover for GL350	Case top, normal	1	

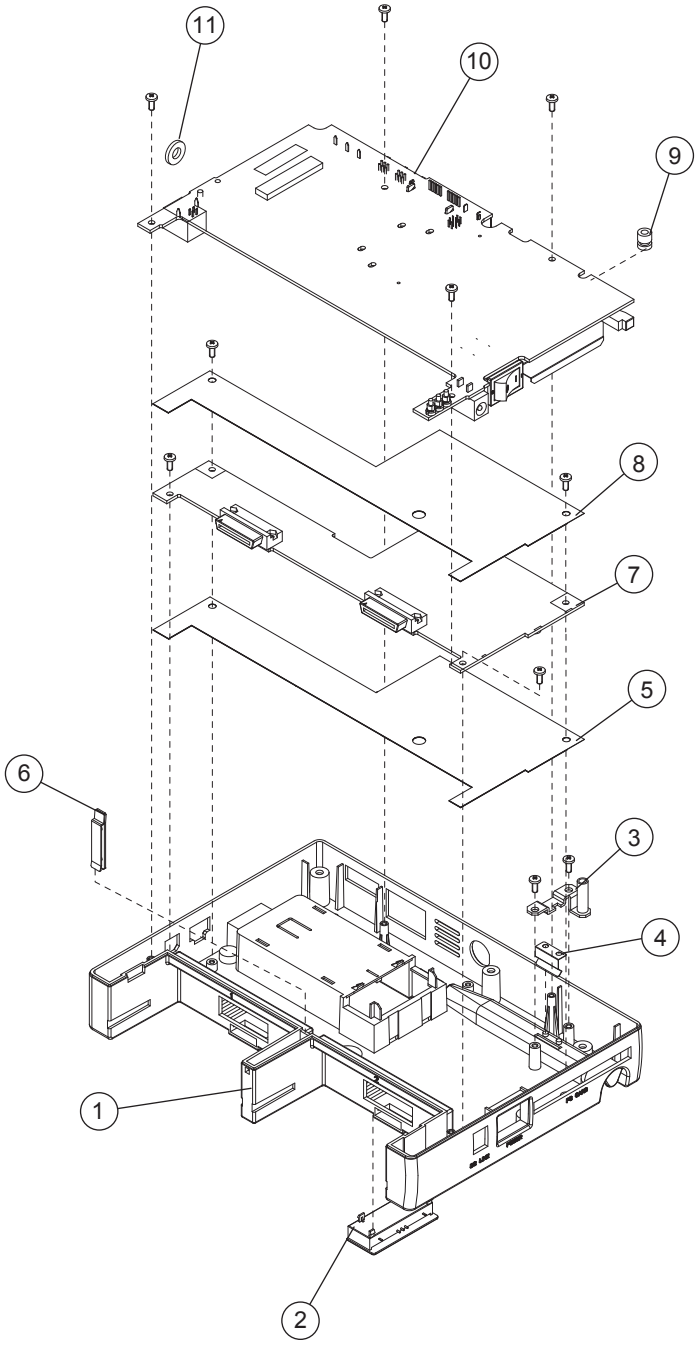
Top Cover, GL350



6.2.5 Main Frame

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	604350060	Bottom Case		1	GL400/350
	604450030	Bottom Case 450		1	GL450
2		Battery Connector		1	
3	604350211	Spring Hold-down Plate		1	
4	604250090	Screwdriver Spring		1	
5	604350180	AMP Sheet		1	
6	604400090	Rear Lift-up Hook for GL400		1	GL450/400
	604350280	Rear Lift-up Hook for GL350		1	GL350
7	770435103	AMP Board		1	
8	604350151	AMP Shield Sheet		1	
9	604400080	Spacer for GL400		1	GL450/400
	604350260	Spacer for GL350		1	GL350
10	790435700	Main Control Board		1	GL400/350
	795401700	Main Control Board for GL450		1	GL450
11	604450010	Spacer for Humidity Sensor Jack		1	GL450

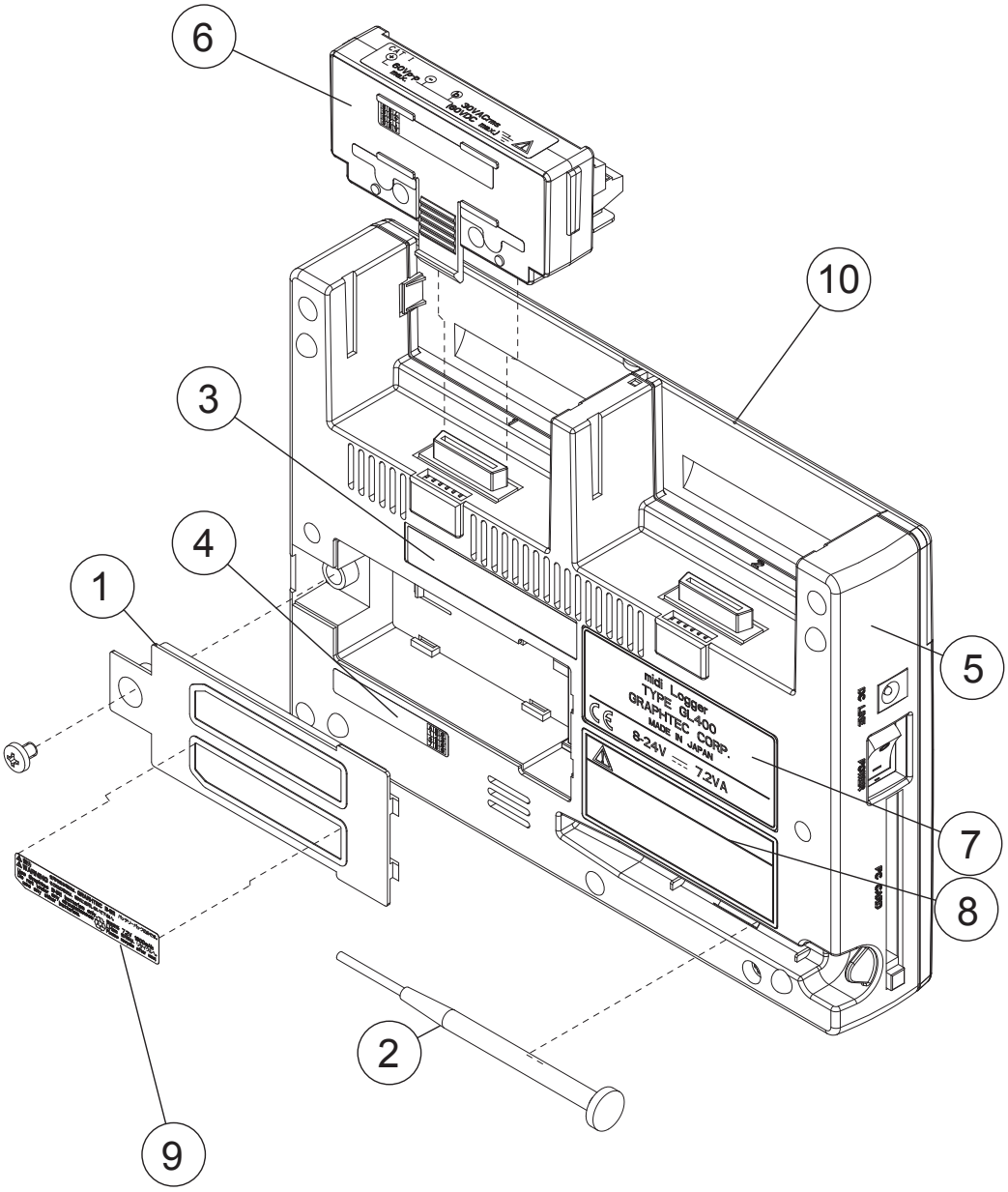
Main Frame



6.2.6 Bottom Case

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	604350020	Battery Cover		1	GL400/350
	604450020	Battery Cover 450		1	GL450
2	305820001	Screwdriver	NDV-4	1	
3	613262360	Informatiom Label	Japanese model only	1	Japanese only
4	054025740	Serial Number Label		1	
5	604350060	Bottom Case		1	GL400/350
	604450030	Bottom Case 450		1	GL450
6	795350310	Input Terminal Unit 10SU		1	GL400/350
		Input Terminal Unit 10TU		1	GL450
7	604350941	Model Name Label GL350		1	GL350
	604400911	Model Name Label GL400		1	GL400
	604450070	Model Name Label GL450		1	GL450
8	604350801	Caution Label		1	
9	604350830	Warning Label		1	
10	604350000	Input Terminal Unit Cover		1	

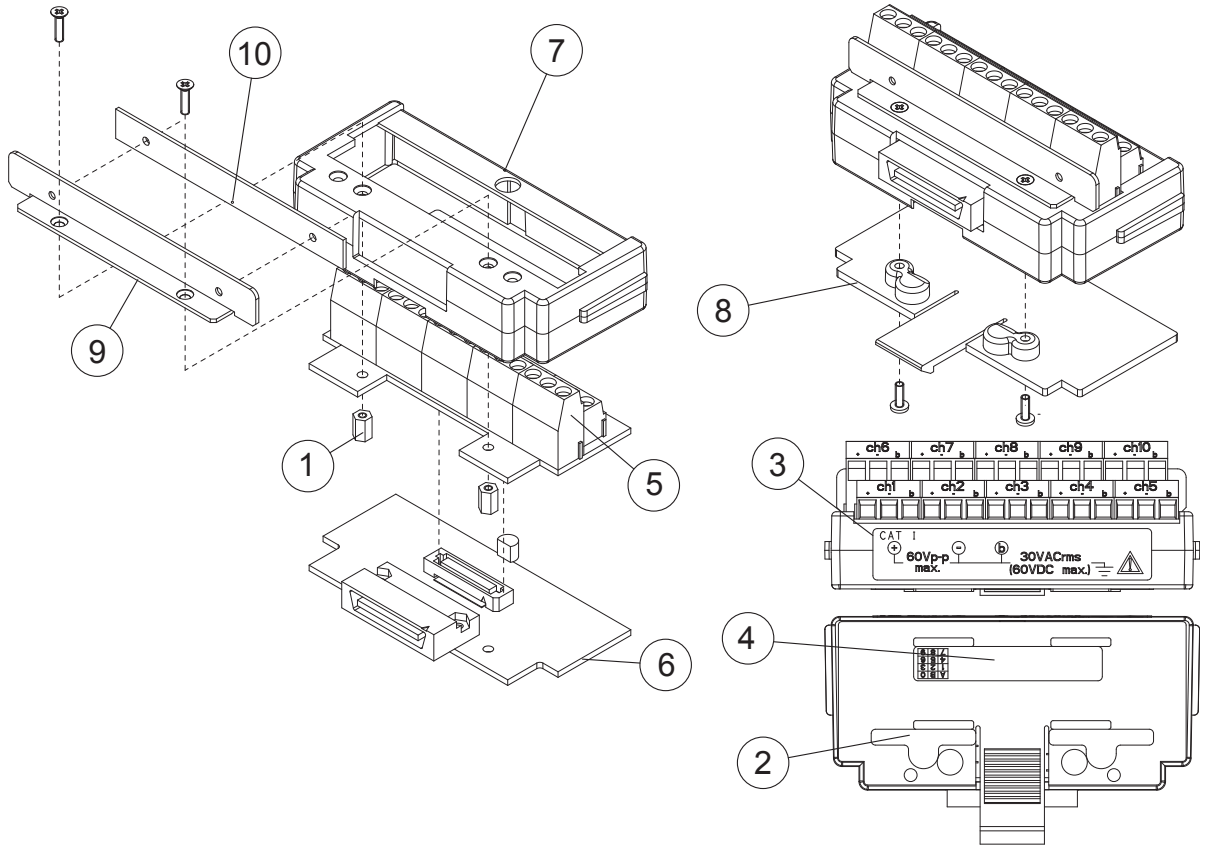
Bottom Case



6.2.7 10-CH Input Terminal Unit

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	393020060	Spacer ASB-2006		2	
2	604350850	TM Bottom Label		2	10SU
	604450130	TM Bottom Label 450		2	10TU
3	604350860	CAT Label		1	
4	054025740	Serial Number Label		1	
5		Input Terminal Board	These parts are not available with single part. Supplied by the input terminal unit assembly.		
6		Input Terminal Relay Board			
7	604350010	Input Terminal Top Case		1	10SU
	604450100	Input Terminal Top Case 450		1	10TU
8	604350030	Input Terminal Bottom Cover		1	10SU
	604450110	Input Terminal Bottom Cover 450		1	10TU
9	604350801	Input Terminal Flat Plate		1	10SU
	604450120	Input Terminal Flat Plate 450		1	10TU
10	604350160	Input Terminal Flat Rubber		1	

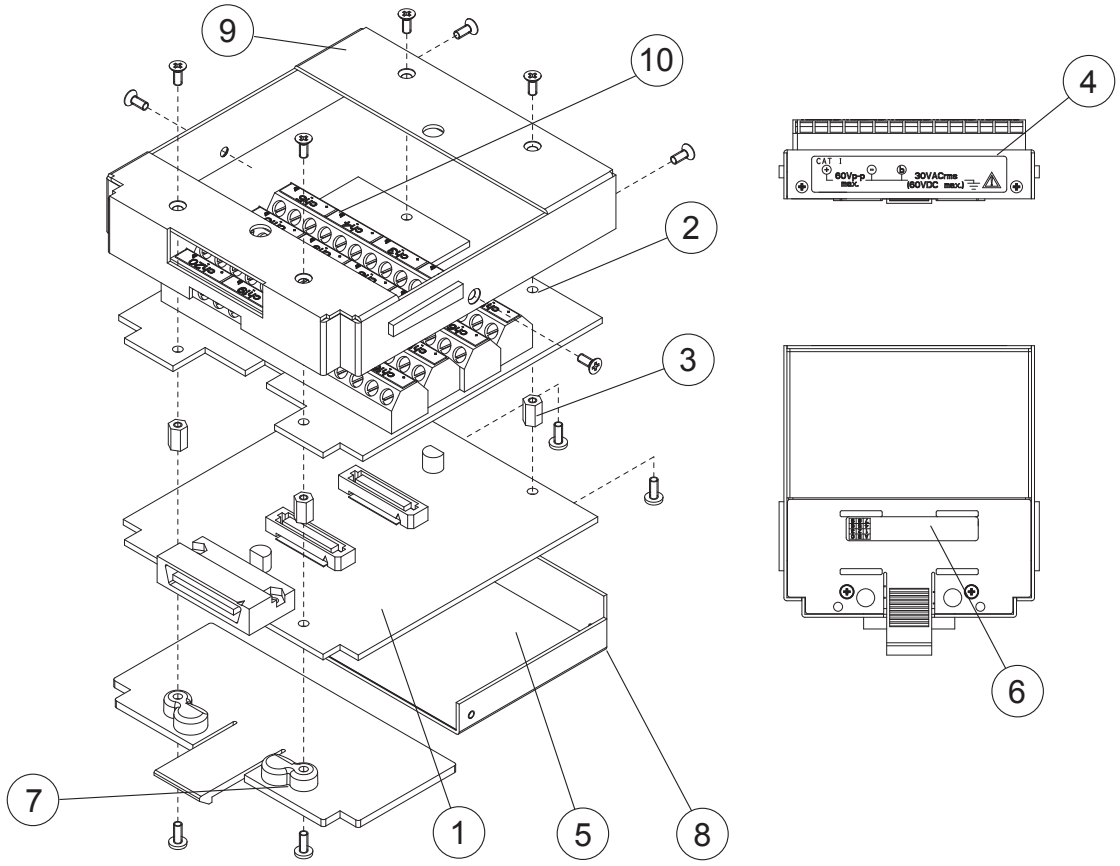
10-CH Input Terminal Unit



6.2.8 20-CH Input Terminal Unit

No.	Part No.	Part Name	Description	Q'ty	Remarks
1		20-CH Input Terminal Relay Board	These parts are not available with single part. Supplied by the input terminal unit assembly.		
2		20-CH Input Terminal Board			
3	393020060	Spacer ASB-2006		4	
4	604350860	CAT Label		1	
5	604350240	20-CH Insulating Sheet		1	
6	054025740	Serial Number Label		1	
7	604350030	Input Terminal Bottom Cover		1	20SU
	604450110	Input Terminal Bottom Cover 450		1	20TU
8	604350112	Input Terminal Bottom Case		1	20SU
	604450140	Input Terminal Bottom Case 450		1	20TU
9	604350102	20-CH Input Terminal Top Case		1	20SU
	604450150	20-CH Input Terminal Top Case 450		1	20TU
10	604350820	20-CH Label		1	

20-CH Input Terminal Unit

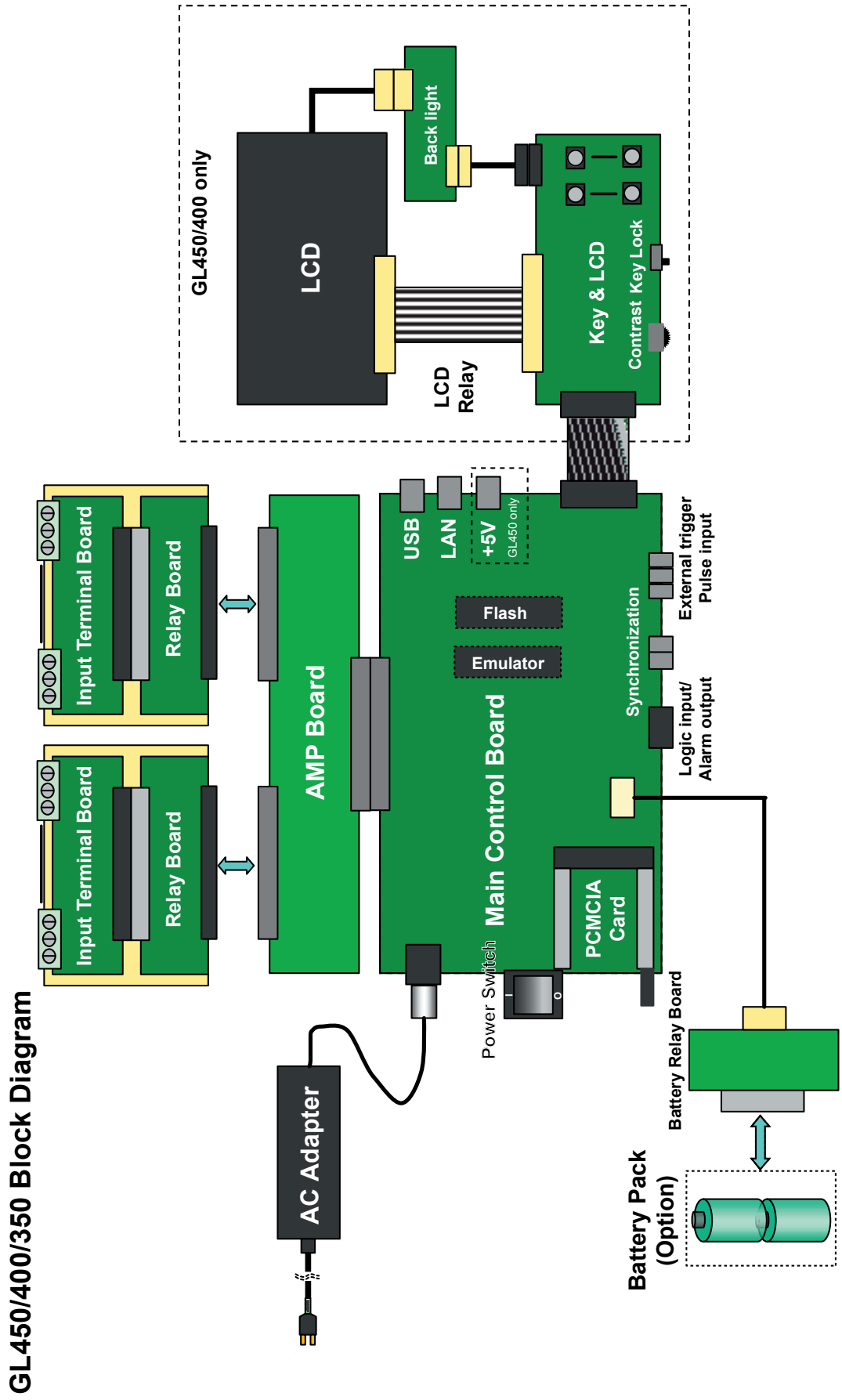


6.2.9 AC Adapter

No.	Part No.	Part Name	Description	Q'ty	Remarks
1	500051951	AC Adapter	SA45-3129	1	
2	500052004	AC Power Cable 100V JAPAN	361-70100020-01	1	Depends on the country
	500052350	AC Power Cable UL	UC-671-N03	1	Depends on the country
	500052402	AC Power Cable CEE	EN-514-N04	1	Depends on the country
	500052397	AC Power Cable BS	BS89/3-C7-1.8m	1	Depends on the country

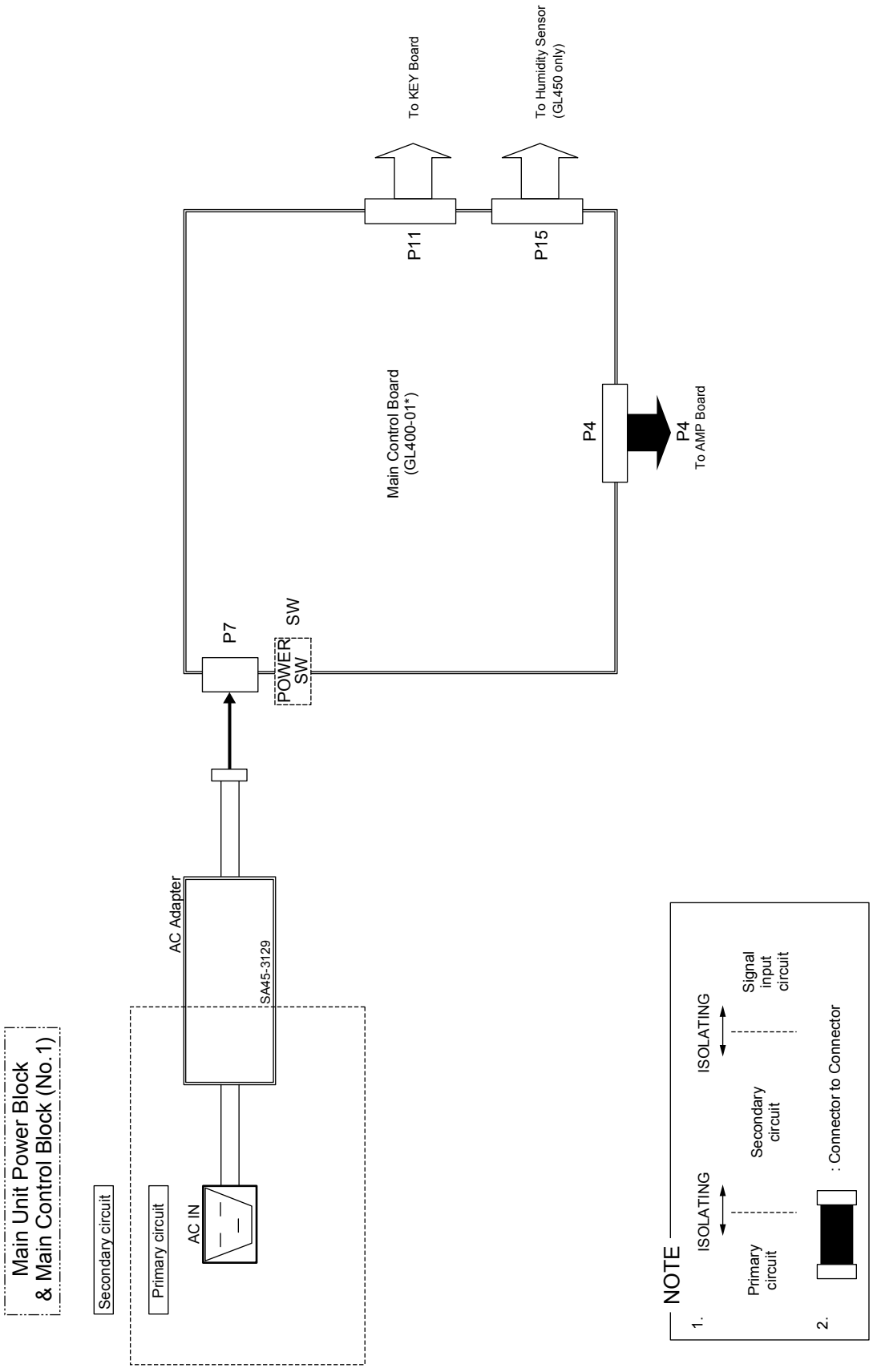
7. Block Diagram

7.2 Block Diagram

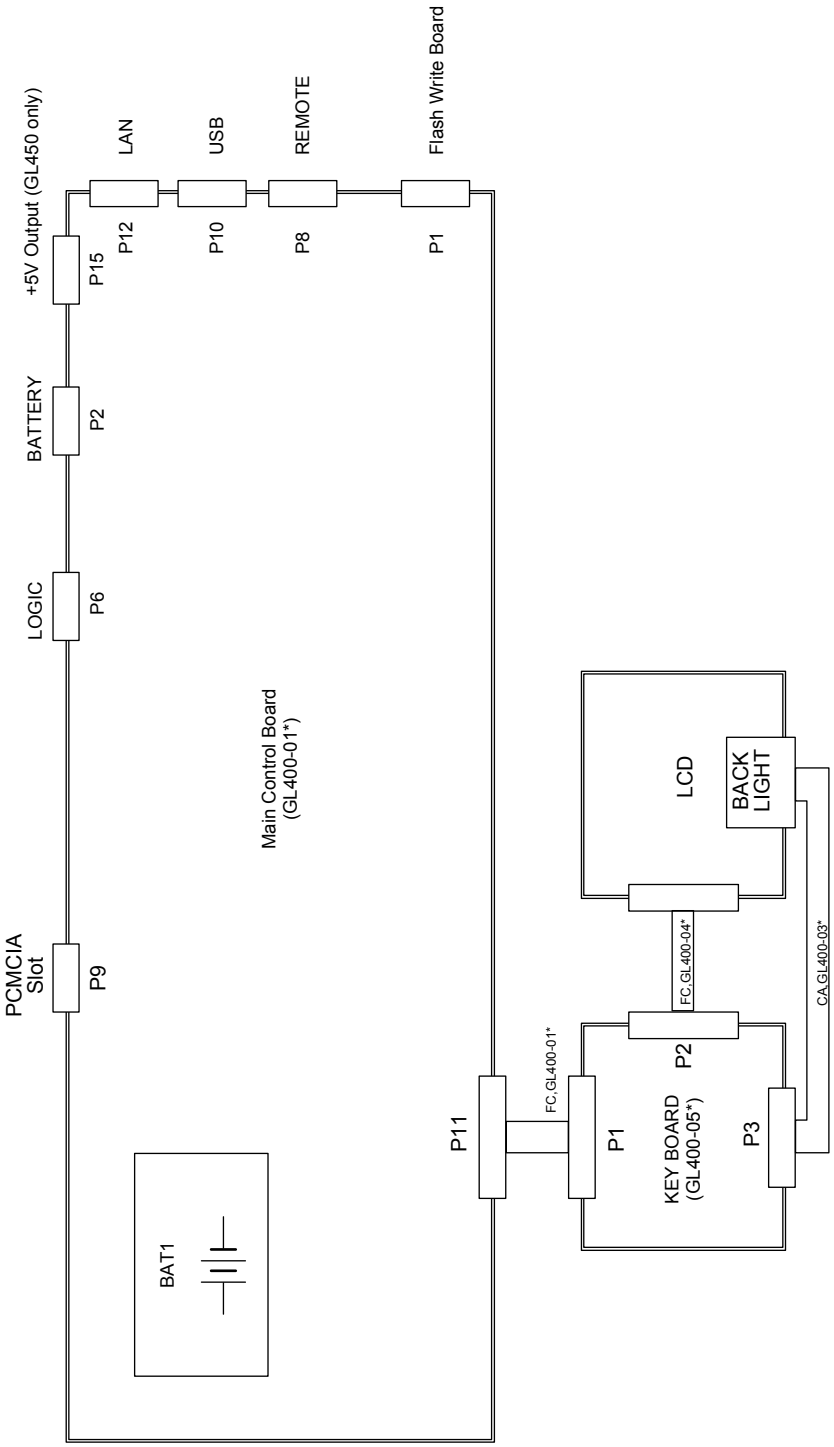


7.2 Wirring Diagram

Main unit power block & main control block (No.1)



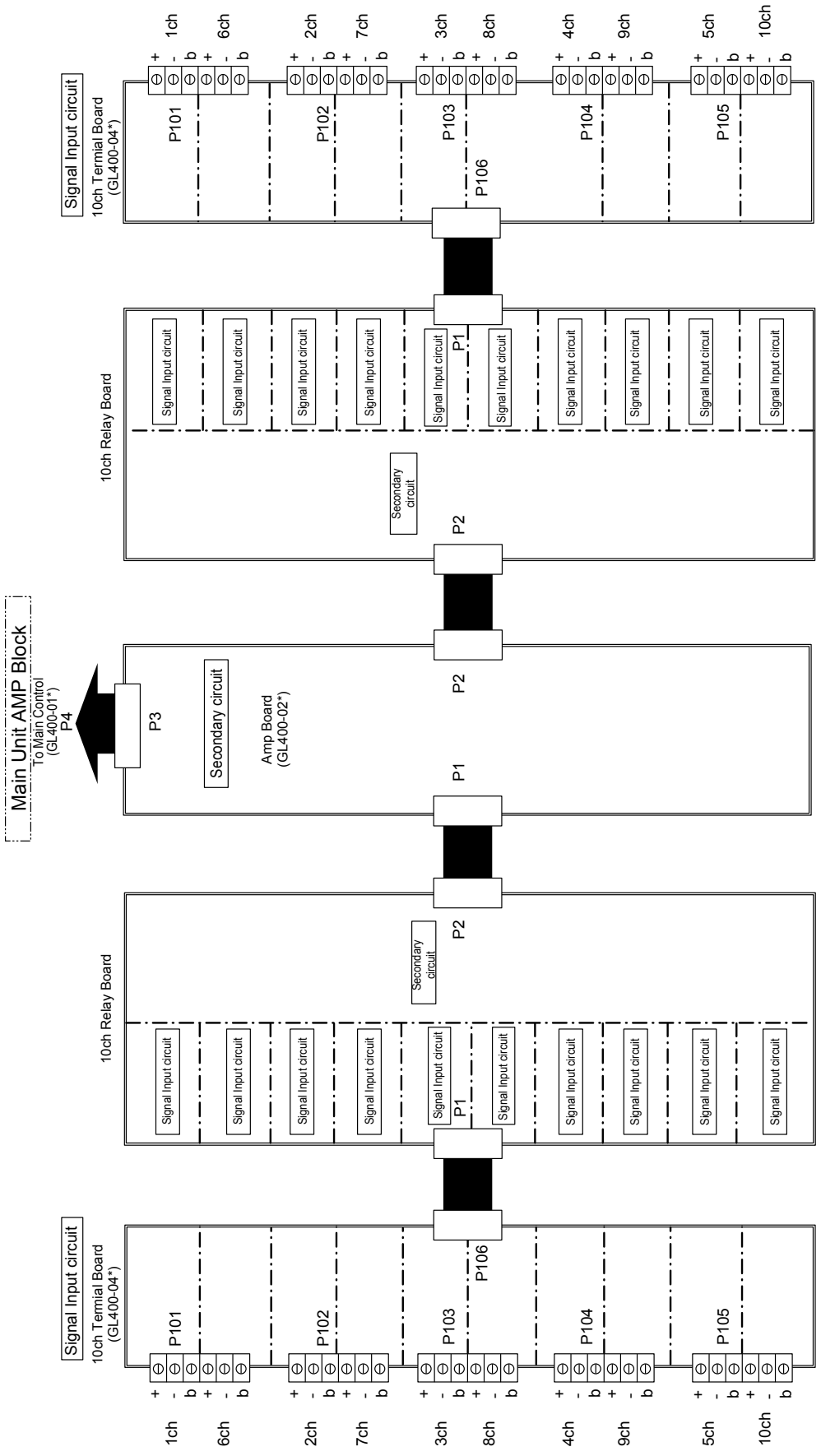
Main control block (No.2)



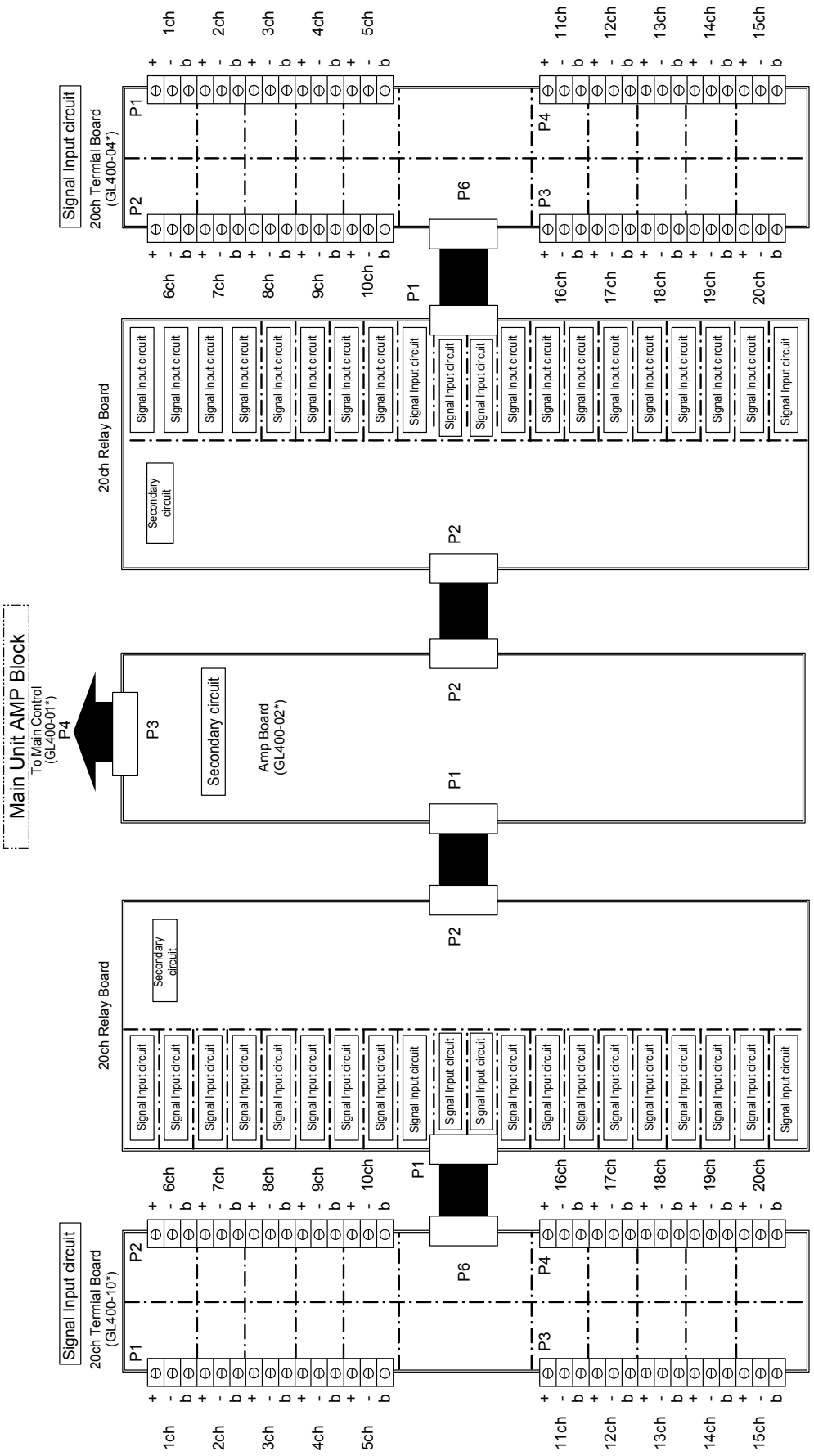
Main Control Block (No.2)

Secondary circuit

Main unit 10ch AMP block



Main unit 20ch AMP block



Details of AMP block